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MACKENTY COMMEMORATIVE MEETING

A HISTORY OF THYROTOMY AND LARYNGECTOMY.*

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It is my privilege tonight to share in this tribute of the New York Academy of Medicine to the memory of a man whom we have all known and appreciated, a surgeon recognized throughout the world.

By a strange coincidence, the history of thyrotomy and laryngectomy begins and ends in this place; for it was Dr. Gurdon Buck who, in 1851, first performed thyrotomy in the removal of a laryngeal cancer, and Dr. John Edmund Mackenty who, in a lifetime of effort, brought laryngectomy to a state of perfection never until now attained.

While others have gained well deserved distinction in this work, four names following that of Gurdon Buck stand out as pioneers with special prominence. Dr. Patrick Heron Watson, of Edinburgh, by whom laryngectomy was first performed; Gluck, of Berlin, who so modified the early unsuccessful operation as to make it practicable; Solis-Cohen, of Philadelphia, who introduced the Gluck method to this country with additions of his own; and last, our late friend, who, following the example of Gluck and Solis-Cohen, placed the procedure upon the substantial basis it now occupies, and by his

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intelligent and persistent effort clearly proved the value of the new order which must forever supersede the desultory and unsatisfactory work of the past.

Contemplating the rise and development of laryngeal surgery, no higher tribute could be paid to those instrumental in bringing it about than the contrast of the early statistics with those of today, and in particular to those of the one whose life work we have met this evening to eulogize. From uncertainty he evolved order, and established a fair degree of dependable knowledge; from more or less individualistic treatment he, more than any other, instituted a system founded upon experience and, carefully tabulating the results of his manifold opportunities and efforts, submitted his reliable deductions to the world. Whatever else he accomplished, and he did many other good things, his work in the advancement of laryngectomy has placed him foremost of his contemporaries.

Thyrotomy: The history of these operations is of comparatively recent origin; indeed, it is embraced almost within the limits of my own recollection. While thyrotomy was proposed by others for the removal of laryngeal polyps (so-called) as early as 1840, the credit for its employment in intralaryngeal cancer clearly belongs to that great surgeon, Dr. Gurdon Buck, of the old New York Hospital and the Academy of Medicine. Jonathan Wright's History of Laryngology makes no mention of him, but having in 1848 devised his intralaryngeal method for the relief of edema of the glottis, having improved tracheotomy, and having performed pioneer work in that as in other directions, he was unanimously accorded in Europe, the title of "Father of Intralaryngeal Surgery."

In May, 1851, he added to this reputation by successfully operating by thyrotomy upon a case of intralaryngeal cancer, the patient surviving until Aug. 4, 1852 (quoted by Henry B. Sands: "Thyrotomy—62 Cases." *New York Medical Jour.,* May, 1865, p. 110). Dr. Solis-Cohen repeated the operation in 1868, curing his patient and in 1887 exhibiting him in excellent health and with a fair voice (*Medical News,* Dec. 3, 1887). These pioneers were followed by Dr. Clinton Wagner, of New York, whose modifications and improvements raised the operation to a high degree of efficiency and marked him as the most accomplished master of thyrotomy of his time. Dr. Wagner found, among other improvements, that by securing absolutely perfect linear coaptation of the severed edges of the thyroid cartilage, the voice was not impaired. In order to facilitate this, I suggested that the perpendicular incision through the thyroid be interrupted at its middle by a small triangular indenture. In his hands as well as in my own, this simple expedient proved of value.

Among other things, he devised a small circular saw by which in cases of calcification of the thyroid a smooth and even incision might be made. In 1896, Dr. Wagner reported fifteen thyrotomies upon patients aged from 64 years to 18 months. Five were living at periods of more than one year, one at twelve years and one at seventeen years. Of those not living, one survived four years; two, one year; one, three months; and one, ten weeks. In no case was death due to operation. Four were cases of epithelioma that lived, respectively, for four years, one year, three months and ten weeks. An experienced surgeon and accomplished laryngologist, his ingenuity and skill added many useful details to the operations for which he should be given credit.

Sir Henry T. Butlin, in 1908, in his pamphlet on "The Results of Operations for Cancer of the Larynx," reviewed his cases to that date. He had performed 41 operations for thyrotomy, hemilaryngectomy and total laryngectomy, 31 having been for thyrotomy. Fifteen reported cured for three years or longer. Following his earlier attempts, which were not so successful, in his last 31 operations there were only two fatalities, "more likely to have been due to defective after treatment and occuring in bad subjects."

Semón, an imitator of Butlin, advanced several ideas. His best contribution related to the malignant degeneration of laryngeal papillomata. The occurrence of this, like many other observers, he denied and by the study of a large number of published cases and opinions, seemed to have proved his thesis. Adopting the views of Butlin, he was an advocate of thyrotomy, believing that laryngectomy should be used only in well selected, intrinsic cases. Where outside extension was present, operative results were not promising.

The limited number of Semón's personal cases hardly warranted the exploitation given them; in order to deduce conclusive percentages there should have been many more. Among other statements, the claim was made that if a patient survived for one year, or at most for two years, the disease was cured; the theory being that, if the growth reappeared, such reappearance was not a recurrence but an actual new growth in another place. This at once raised the question as to when any growth should be considered as actually cured, the word "cure" presupposing its complete and permanent eradication. With the lapse of a few years this idea was disproved by the constant appearance of recurrences in cases supposedly free, such instances following all types of operation after widely carying periods of time (see Case No. 1).

While many have practiced thyrotomy since the days of Buck, Wagner and Butlin, the best present record is that of Sir St. Clair

Thomson of London, an ardent follower of Butlin, whose improvements in the care and technique of thyrotomy have greatly enhanced its value. Sir St. Clair Thomson reports 70 thyrotomies. Of these, 34 were cured and are now living for from three to nineteen years. There were eighteen deaths from causes other than operation, occurring in periods of from three to fourteen years, seven metastases in from seven months to eleven years, the larynx remaining free: and eleven deaths, or 15.7 per cent, from local recurrence in from four months to four and a half years (Transactions, American Laryngological Association, 1928)* (see Case No. 2).

Laryngectomy: To Patrick Heron Watson, of Edinburgh, is unanimously credited the first actual removal of the human larynx. This he did in the year 1868, and in the succeeding two years operated on several other cases. As a pioneer, himself and his assistants untrained, the technique of the operation undeveloped, and with no knowledge of the after-care of the patient, it is not strange that all died. Naturally these brave ventures of Watson met with general condemnation, but the idea was propounded, and Czerny, the assistant of Billroth, of Vienna, the greatest surgeon of his day, recognizing its possibilities, demonstrated its practicability through animal experimentation and in 1870 operated with success upon a number of dogs. Billroth, in 1873, successfully removed the larynx of a man, who survived for several months (reported by Gussenbauer, *Archiv. fur Klin. Chirurg.*, XVII, 1874, p. 343); while in 1874, Heine and Mass repeated the operation. It was in the same year that Gussenbauer also operated and devised an artificial larynx, the first of its kind (see Case No. 4).

Succeeding the original announcement in 1868, the following ten years witnessed a repetition of the operation at various hands, and reports from Europe by slow degrees found their way to us. The first laryngectomy in this country was performed in 1879 by Dr. Frederick Lange, a surgeon in high standing at that time, residing in New York (*Archives of Laryngology*, 1880, Vol. I, p. 36). His aid was sought by the family of the senior member of the firm of the Anheuser-Busch Company, of St. Louis. By our present standards the case would not have been considered promising, for the patient was advanced in years, his general condition unfavorable, and the progress of the disease extensive. Nevertheless, the larynx was suc-

*Thomson believes that if intrinsic cancer of the larynx is diagnosed early it is best operated upon by thyrotomy, an operation which should be free from danger to life and be followed by freedom from mutilation and loss of function, with adequate voice and lasting cure. Mackenty does not agree with this, preferring total excision as offering greater freedom from recurrence. Both insist upon the careful selection of cases.

cessfully removed, but with resulting conditions which within a week drove the patient to terminate his life. The widespread reports of this were naturally discouraging.

In 1877, Foulis, of Edinburgh, reported his first case (*Lancet*, Oct. 13, 1877), and in 1881 published a paper in which he had collected reports of 32 complete and six partial laryngectomies. The results of these cases were bad; the method was unanimously and severely criticized (Transactions, International Medical Congress, Vol. III, p. 251, 1881).

Still the work continued, surgeon after surgeon entering upon it, apparently with the hope that his own skill might prove superior to that of others. With characteristic urge for truth, Dr. J. Solis-Cohen, of Philadelphia, collected 65 cases, all of the reports and statistics available; and after careful study, in 1883, published an impressive article clearly setting forth the results of the operation to that date (Transactions, College of Physicians, Philadelphia, April 4, 1883, p. 353). His deductions, based upon the work of the foremost surgeons, were startling. Fifty per cent of those thus treated had died from operation. The initial shock was severe; the operation had cost the sacrifice of a certain number of lives, and the conditions of the survivors had often been described as pitiable in the extreme. In Solis-Cohen's opinion, "laryngectomy had not tended to the prolongation of life; and the prolonged existence of a very few cases seemed purchasable only at the sacrifice of the remnant of existence of many others."

Impelled by the same high motive that had actuated his predecessors, the studies and observations of Solis-Cohen were continued with ever increasing zeal while, notwithstanding the universal experiences, surgeon after surgeon essayed the operation with the almost invariable result, that after a few unsuccessful efforts the procedure was abandoned. Here and there more or less success was attained, generally by men of acknowledged surgical distinction. Many cases were brought to me for consultation or advice, and not a few of them were operated upon by the ablest talent available. By far the best of the operators in my own circle was the late Dr. William Tillinghast Bull, who had been a pupil and an assistant of Billroth and had gained from him advanced ideas of technique and care. Even with his rare judgment and surgical skill, the results gave only qualified encouragement; while all our patients survived operation, the majority died of recurrence or of intercurrent accidents, few surviving more than a year or two.

During this time Gluck, of Berlin, adopting the best ideas of his predecessors, had put them in practice and added his own. One of

them was destined to create a new era. Soon he gained a following and accumulated a large number of cases, operating as it seemed upon all who came to him, apparently little deterred by conditions of advancement of the disease. At the Sixteenth International Medical Congress held at Buda Pesth in 1909, I was present when he exhibited four patients upon whom he had performed his most extensive operation for the removal of widespread malignant disease of the throat. Upon one patient there had been a total extirpation of the larynx, with removal of the affected adjacent parts of the esophagus, pharynx, tongue and lymphnodes. All had survived for a period of two years or more and all appeared to be in fair general condition. The mutilation in these cases was conspicuous, the whole front of the throat having been removed, leaving a hollow of surprising extent, although completely covered with healed integuments. These operations, however, proved the practicability of such extensive resection of important parts with successful recovery; and, secondly, the possibility of prolonging life where carcinoma had extended so far outside the larynx as to make a simple laryngectomy useless.

Undoubtedly, next to his method of dealing with the trachea, Gluck's most important contribution was the example he gave of the importance of organization and concentration in the carrying on of his work. Imperfect and unconvincing as some of his results may have been, he established a significant precedent.

Before the introduction and adoption of Gluck's improved method relatively few patients had survived; many died from shock, aspiration pneumonia, septic conditions, starvation or despair. In 1881, Gluck, in order to avoid these dangerous reactions, suggested an operation in two stages. In the first operation he severed the trachea from the larynx and sutured it to the skin, two weeks later removing the larynx. Later, he performed the operation in one stage, as we know it today. In this he released the larynx and upper part of the trachea from their attachments and then, severing the larynx from the trachea, brought the tracheal stump to the outside of the neck and sutured it to the skin. Before detaching the larynx from the trachea he closed the hypopharyngeal defect. The trachea and larynx, thus raised above the wound level, partially prevented the entrance of blood into the lungs during the operation. A serious defect of this measure was the danger of blood flowing through the larynx into the lung where it might act as a foreign body and cause pneumonia. One of the improvements introduced by Dr. Mackenty was the overcoming of this defect. The work of Gluck and his associate Soerensen up to 1920 gave results far beyond anything accomplished before that time, according to their published records.

Following the paper of Solis-Cohen, of 1883, among the first statistics of note were those published by Sir Morell Mackenzie, in 1888, apropos of the question of the proposed operation in a certain celebrated case. In a resume of Mackenzie's statistics, of 22 cases of thyrotomy for laryngeal cancer, 27 per cent died within a year; three patients lived for 15, 19 and 22 months, respectively.

In 35 operations for partial extirpation, 42.85 per cent died from operation; and only five were living at the end of one year.

Of 183 cases of laryngectomy, there was an operative mortality of 36.23 per cent; 21 died within six months, twelve within one year, five in 18 months, one at two years. Of the rest there was no record.

Billroth reported eight cases of thyrotomy, two well at three, two and one-half years, respectively.

In 1887-88 occurred a crisis in the consideration of the treatment of laryngeal cancer. For twenty years it had been under the practical tests of the surgeons of the world. At this period a case arose which challenged the wisest judgment as well as the most approved skill. The Crown Prince of Germany manifested signs of laryngeal disease. At once questions of greatest seriousness presented themselves. Could the patient be operated upon with fair hope of prolonging life? Without operation the average of life probable in such a case as his was from one to one and one-half years. Did the results of operation promise as well? The surgeon of choice would have been von Bergmann.

In seven cases operated upon by him, between 1883 and 1889, the average duration of life was nineteen weeks, the longest life a year and a half.

Thus the experience of the time justified refusal and the probability that the life of Frederick would be prolonged for at least a year if operation were not attempted was realized.

The notoriety of the case of the Emperor Frederick excited world-wide attention to its surgical aspect and great impetus was given the study and practice of laryngectomy, both abroad and here. More and more the writer became convinced of the unscientific status of the operation and of the unreliability and incompleteness of its alleged statistics. Accordingly, in 1900, he endeavored to collate a series of statistics based upon available literature (Transactions, American Laryngological Association, May 20, 1900; also, *New York Medical Jour.*, Sept. 15, 1900). Already articles had been published by Charles A. Powers, of New York; Schmiegelow, Sendziak, Wassermann and others. None were satisfactory, owing to the imperfect material with which each had to deal. In preparing

the writer's own tables and studying those of others, it was evident that there were *no* reliable statistics of operations for the surgical relief of malignant disease of the larynx, nor could there be until a sufficient number of operators of accredited standing had been willing faithfully and fully to report every case in all its details.

In the year following, Hermann Krause, of Berlin, published a summary collected by various authorities. Of 466 cases, 39 or nearly 13 per cent, were claimed as successful because the patients were alive and without recurrence for a year after operation; but of 20 who lived for over a year, 15 died before the end of the third year (*Allgemeiner Wiener Med. Teitschrift*, 1891, No. 15).

As we have said, the improved method of Gluck was first introduced to American surgery by Dr. J. Solis-Cohen, of Philadelphia. In the presence of Prof. Keen and others, in 1892, he removed the larynx of a patient and, for the first time in this country, attached the severed end of the trachea to the skin. The whole of the complicated procedure, including the anesthetization and dressing, occupied the space of one hour. Dr. Solis-Cohen's report of the case is full of interest (Two Cases of Laryngectomy for Adenocarcinoma of the Larynx. *New York Medical Jour.*, Nov. 12, 1892). He says: "The patient was then put to bed, with the head much lower than the thorax and this position was maintained for several days. He was carefully watched; I stayed with him for sixteen hours, and during this time I instructed a number of young men connected with the throat and surgical clinics of the hospital how to take charge of the case. Two of them were constantly with him for eighty hours. Twice during that time the man would have died had skilled hands not been present to remove mucous from the trachea. The patient had no trouble in coughing. It is to the close attention of these young men for the first eighty hours, and to the admirable services of our chief surgical resident that this patient mainly owes his life: for the attention after such an operation is far more important from the clinical point of view than the operation itself, all important as that is."

In 1895 I exhibited this patient, Daniel Hickey, at the annual meeting of the British Medical Association in London, three years after operation. He was in perfect health, entirely comfortable, breathing freely through the tracheal opening in the neck *without a tube*, and the first in this country to have acquired a pharyngeal voice, plainly audible at considerable distances (*British Medical Jour.*, Oct. 20, 1895) (see Case No. 3).

It is noteworthy that in certain cases operated upon by laryngologists their success was greater than that of the general surgeons;

for the reason perhaps that they had a better knowledge of the throat and its functions and a more refined appreciation of the delicacy and complicated nature of the region. This has been well illustrated in the cases of Clinton Wagner, of Solis-Cohen, and of Mackenty himself, all of whom were accomplished surgeons of extensive general experience.

Spurred by notoriety, laryngectomy pursued its uneven course. In 1893 the writer published an article on "The Withholding of the Statistics of Operation," etc., and said: *"In view of the fact that the earliest statistics of laryngectomy were somewhat better than those of recent years, may it not be possible that this operation, if practiced at all, should be restricted to a few highly skilled and successful surgeons rather than committed to those whose experience in it has been limited or altogether wanting. Let every case be reported with careful detail not only as to the method of operation but, almost more important still, with clear and full description of the after-care of the patient and the special difficulties and accidents presented with each individual, for the after-care is often by far the most trying and hazardous part of the whole matter."

In a discussion which I opened in London, in 1895, before the Laryngological Section of the British Medical Association, in which my alternate was the late Sir Henry T. Butlin, accompanied by Sir Dundas Grant, Dr. Semón, Sir St. Clair Thomson, Dr. John N. Mackenzie, of Baltimore, and others, in which numerous new suggestions were advanced, the subject being, "On the Indications for Early Radical Treatment of Malignant Disease of the Larynx" (*British Medical Jour.*, Oct. 20, 1895), I said:

"I have brought forward these suggestions for the purpose of placing them prominently before you and of leading up to the main proposition of the discussion. I have sought to call attention to the importance of bringing to the case the highest diagnostic skill; the necessity in dealing with it for the exercise of peculiar special ability, on the one hand, and of eminent surgical experience on the other; the urgent importance of surrounding the patient with every possible means of aid, and of eliminating as far as possible every element of danger. While fully appreciating the good work already done and recognizing the hopeful outlook for the future, I have dwelt with all possible emphasis upon the difficulties, uncertainties and dangers of the present situation, for the purpose of insisting upon the urgent gravity of the subject and of distinctly discouraging the class of effort which has too often been brought to bear upon these cases. Personally, I have never performed a laryngectomy or thyrotomy

*New York Medical Journal, Oct. 14, 1893.

for cancer; otherwise it would be impossible for me to advance the proposition that I am about to offer. Pray do not misunderstand the spirit in which it is given, but receive it with the largest possible share of humane impulse and of generous breadth of view.

"We are fairly groping for light for the relief of one of the darkest of human ills, almost beyond the pale of individual ambition; for these patients are usually too poor to appeal to the acquisitive man and the operation has been so often performed that to lose a patient or two for the sake of having done it has long since ceased to bring anything but discredit. The majority can well afford to exercise a fair amount of self-denial if by so doing the general good may be promoted. I am strongly of the opinion that for a time, both the welfare of patients operated upon and the interests of science demand that the indiscriminate performance of capital operations upon the larynx should cease. In most great centres there are individual surgeons or groups of operators who are especially well fitted both as to personal qualifications and hospital facilities for the successful performance of this work, as has been proved already by the records which they have made. Let such men surround themselves with the properly trained assistants; let them systematize their efforts and use all diligence in the perfecting of appliances and methods and in the study of the cases under them; let them keep careful and accurate records of everything pertaining to the history of their work; then resign to them, for the time being, the care of as many cases of laryngeal cancer as possible. When a sufficient amount of statistical material has been collected, let it be placed upon a substantial scientific basis; and, as one advance after another has been made, let the general result be given to the profession. By this course we would soon learn whether the radical extirpation of laryngeal epithelioma is on the whole unjustifiable or whether, as we have reasons for hoping, it will have proved a success. Already the example has been set in this place, London. It would be fortunate indeed if it should be followed, and with as gratifying results, in other parts of the world."

This proposition, reasonable in the light of unhappy experience, was received with audible murmurs of disapproval. Men were unwilling to resign their patients to others. My restrictions, especially as to the selection of cases, were "too rigorous," my demands in general too great. My address was vigorously criticized on theoretical grounds and was finally buried in the columns of the *British Medical Jour.* Not only was sympathy lacking, but there was no evidence whatever of "humane impulse or of generous breadth of view."

In May, 1909, discussing papers of Dr. Chevalier Jackson and George W. Brewer here at the Academy, both of whom had essayed laryngectomy, I maintained that operations in general for the cure of carcinoma of the larynx had in the aggregate shortened the sum total of the possible duration of human life; "for the average patient, not operated upon, would probably live for from one to one and one-half years after the time early operation should have been performed. Indiscriminate operating had resulted in a high rate of mortality, while the refusal of many operators to report unsuccessful cases had made it impossible to know whether such operations are justifiable."

In 1913 Gluck and Soerenson published their statistics of 303 cases of carcinoma of the larynx: 31 thyrotomies; no deaths and three recurrences. 47 hemilaryngectomies; one death due to operation; 13 recurrences; all reoperated, one died; 17 remained without recurrence; one lived 11 years. Length of time without recurrence, eight years to one year. 244 cases of total laryngectomy. 132 simple excisions, with no deaths. 74 excisions with resection of larynx; 19 deaths. 38 combined with transverse circular resection of pharynx and esophagus, three deaths. 24 cases survived for from 15 to four years. Of the cases traced there were 30 recurrences. (Gluck, T., and Soerenson, J.: Resection und Extirpation des larynx, pharynx und oesophagus. *Handbuch der Speziallar Chirurgie des Ohres und der oberen Luftwegen*, 4, 1-105, 1913.)

In 1920 these authors published a new series of 100 laryngectomies, with results even more favorable for lasting cure. Ninety-eight patients survived operation. Two only died; these of heart failure due to bronchitis after operation. Local recurrences after operation seldom occurred. (Gluck, T., and Soerenson, J.: Results of a New Series of 100 Total Extirpations of the Larynx. *Archiv. f. Laryngol. u. Rhinol.*, 33:84-102, 1920.)

E. J. Moure, of Bordeaux, and various others reported series of cases, the most important being those of A. G. Tapia, of Madrid, who reported a series of 106 laryngectomies with no fatalities; but unfortunately with these he had 32 recurrences.

The statistics of Dr. Fielding O. Lewis, of Philadelphia, are among the best attainable, because they are most complete: Number of patients operated upon, 163: extrinsic, 84; intrinsic, 72; other diseases, two (one lues, one pachadermia. Deaths from any causes within 30 days, 35. Recurrence within one year: extrinsic, nine; intrinsic, six. Recurrence or new growth after one year: extrinsic, seven; intrinsic, three. Alive with recurrence or new growth: extrinsic, six; intrinsic, two. Alive and well after five years: extrinsic, 17:

intrinsic, 32. Alive and well after three-five years: extrinsic, five; intrinsic, seven. Alive and well from one-three years: extrinsic, two; intrinsic, six. Alive and well under one year (cannot count): extrinsic, four; intrinsic, seven. Died of general disease after one year, five.

Causes of death within 30 days: Pulmonary infection (abscess, bronchis, P., etc., nine; secondary hemorrhage, six; under anesthesia (shock), three; shock and myocardial failure, six; G. U. complications, one; apoplexy, one; heat stroke, one; following injection of Gasserian G. for trifacial neuralgia, one; no data, six. Total, 34.

In his valuable general treatise upon the subject, Dr. Mackenty gives an interesting analysis of personal cases of laryngeal cancer and of his own statistics. From 1908 to 1928, the date of publication of his book, more than 383 cases of laryngeal cancer came under his observation. Of these, 130 underwent surgical treatment, as follows: Thyrotomy, 22; hemilaryngectomy, six; total laryngectomy, 102. No operative mortality followed thyrotomy or hemilaryngectomy. Two died; one from septic bronchial pneumonia, and the other from general sepsis; both had diabetes.

Between 1917 and 1924, 55 total laryngectomies and four thyrotomies were accomplished without a death. Two diabetic patients died following operation.

Eighteen thyrotomies were performed prior to 1917; 14 patients died within two years, of recurrence.

Four thyrotomies were performed between 1917 and 1924, with one recurrence seven years after operation.

Many of the early cases were, in the light of present experience, unsuited for any operation short of total laryngectomy.

Six hemilaryngectomies performed prior to 1917 resulted in four recurrences; while 13 laryngectomies resulted in six arrests and two surgical deaths.

Between 1917 and 1922, 31 laryngectomies gave five recurrences. In 24 cases traced after the three-year limit, the disease had been arrested.

From 1922 to 1926, there were 58 laryngectomies, with five recurrences.

Such then, with its surgical strivings and statistical uncertainties, is the history of laryngectomy during its life of more than six decades. Beginning with a long record of operative failure, of shortened existence, and of untold misery, its progress demonstrates that from well deserved disrepute it has risen to a position of actual surgical safety and of comparative comfort to the patient, who, by no means necessarily incapable or unhappy, finds his life prolonged

for many useful employments and himself an acceptable social asset; a result due to the courageous efforts and unremitting labors of a few self-sacrificing men.

Summarizing the present status of these operations and viewing the results from all points, it is evident that notable proficiency on the part of operators is generally attained at the expense of considerable surgical loss. Even with those who ultimately have given most flattering statistics the publication of their early experiences has not always appeared, notably so in the case of Gluck. It will be observed that the best results are of collections of the later cases.

Fully recognizing the brilliant advances shown in these triumphs of modern surgery, there still remain at least two unconquered difficulties. Of the first, I said in 1890, "Nevertheless, since the only hope of saving the life of the patient may depend upon the earliest possible performance of an operation, it is evident that with the diagnostic resources at hand we are far behind in the knowledge necessary to the early recognition and hence to the successful radical treatment of malignant laryngeal disease.*

The second hitherto unsurmounted obstacle to radical cure is recurrence. From the beginning until today, this has seemed an insuperable possibility, of all too frequent happening. Some operators have succeeded in avoiding it better than others, recognizing the necessity for the thorough removal of diseased areas. Its actual occurrence is only more distressful than is the bitter anxiety of the patient over the very thought of its dreaded invasion, a mental feature of unspeakable seriousness, impossible of reassurance or relief.

The advocates of thyrotomy believe that the probability of cure will be in proportion to thoroughness of removal; while the laryngectomists insist upon securing thoroughness through removal of the entire larynx. In both cases expectation is too often disappointed.

From the gratifying results of the leading modern experts, it is proved that my own long continued efforts to remove these operations from the hands of untried beginners and give them over to surgeons thoroughly equipped and of large experience have at last been justified, as evidenced by the vast improvement in the present statistics compared with the results of the indiscriminate work of lesser men; clearly the hopeless surgical outlook of the past has been gradually but steadily overcome.

Again, the careful selection of cases, advocated by me in London in 1895 and received with cold sympathy, is now regarded as of prime importance by the great operators of the present day.

*The Early Diagnosis of Malignant Disease of the Larynx. New York Medical Jour., Nov. 8, 1890.

But as we have often said before, when all that can be done has been attained, we must still look forward with earnest hope to the discovery of the *prevention* of cancer, a triumph which shall forever render surgery needless; meanwhile appreciating with deep thankfulness the work of these great masters of surgery in their beneficent efforts, and lend to them our best support.

As an illustration of personal devotion, what more eloquent example could there be than was shown by our friend? Suggestive of his tireless energy, his wide special knowledge, and his distinguished reputation, during the last six weeks of his life Dr. Mackenty performed eight laryngectomies; all did well.

Finally, not content with what he had accomplished while living, he bequeathed a large fund, the interest of which is to be given for the future comfort of others than those to whom he had already ministered. Until the day when surgery can be forever supplanted, who is there among us to fill his place?

OTHER METHODS.

Radium: Consideration of the surgical features of laryngeal cancer should be supplemented with reference to other proposed methods. Of these radium has attained a position of first importance. In 1915, I published an article calling attention to its possible value in the field of laryngology.* Many experiments made in different directions since its introduction have failed while with time and experience not a few have brought encouraging results. With the proper selection of cases combined with a thorough knowledge of the value and limitations of radium unquestionably good results are at present being achieved. Intelligently used, such accidents as the necrosis of cartilage which at some times follows its use where it has been applied in far too powerful measure are not likely to happen when the method is intelligently used nor does their existence militate against its actual value. The Memorial Hospital, New York, now reports cases of several years' standing in which there has been complete regression of the growth, both from moderate external radiation and from filtered radon buried about the base of the lesion. No secondary necrosis has followed. These cases have been verified histologically. In certain of the growths, extending well below the level of the vocal cords, laryngotomy has been resorted to for accurate placement of the radon seed; for without accuracy there is danger of secondary necrosis. Many extrinsic laryngeal growths

*Med. Record, 1916, XC, 50-52. Also, Further Observations Upon the Use of Radium in Diseases of the Upper Air Passages. The Laryngoscope, 1917, XXVII, 776-781.

are quite radio-sensitive; some have disappeared by external radiation alone.

It seems unfair to criticize this method on the basis of nonsuccessful results gained long ago in the pioneer days of radium when far greater success can now be attained through the more enlightened treatment of the present day. Even in serious surgical cases the value of the application of radium both before and after operation has been demonstrated.

THE ARTIFICIAL LARYNX.

Almost with the inception of laryngectomy, Gussenbauer, as we have said, endeavored to invent an artificial larynx (Case No. 4). Many efforts in this direction have been made since his day; none proved satisfactory. It remained for Dr. Mackenty to produce an apparatus far in advance of others. In the production of this he secured the best possible aid and gave to it the expenditure of much time and ingenuity with results well worthy of attention. The method has been adequately described by him and is familiar to us. It is a question whether any artificial method of voice production could be as satisfactory on the whole as the pharyngeal voice acquired by so many intelligent laryngectomized patients. This subject has been adequately treated in the thesis of Dr. W. Wallace Morrison.*

CASE REPORTS.

Recurrence (Case No. 1): Among many long postponed recurrences observed by the writer, one is of special note: Mr. X. B., age 50 years, complained of irritation in one side of the throat. Examination showed a small lesion upon the left superior border of the epiglottis about a quarter of an inch in diameter and with a well marked margin. Commencing epithelioma was soon verified and excision of the diseased area advised. The patient consulted Prof. Hajak, of Vienna, who removed the growth with about one-third of the adjacent tissue of the epiglottis, extending to the arytenoid. The throat remained normal for eleven years, when the growth recurred in the left arytenoid and extended with great rapidity in all directions. Prof. Gluck, of Berlin, was consulted and by the time operation was performed it was necessary to remove the whole larynx with considerable of the surrounding tissue. Soon the glands showed involvement, the patient returned to this country and, under the advice of Gluck, suffered an extensive operation for their removal under general conditions so unfavorable that he quickly died.

Diagnosis: The middle-aged wife of a physician was found by the best authorities in Philadelphia to have what seemed to them an

*W. Wallace Morrison, M.D., New York, "Archives of Otolaryngology, Oct., 1931, pp. 413-431.

extensive malignant growth which filled the larynx posteriorly and extended widely outside. The condition had been developing for a number of months until dyspnea had become serious. The question at issue was that of radical operation in a malignant condition too extensive to offer great prospect of success but without other alternative. There was no doubt of diagnosis, as that seemed clear, but upon the propriety of the laryngectomy. The patient was of fine physique and excellent courage. Casual examination appeared to confirm the diagnosis already made. Two points, however, were noticeable and at once appealed to me; first, the symmetrical disposition of the growth, unlike that of carcinoma; and second, the tolerably free movement of the arytenoids, never present where malignant invasion of the laryngeal muscles has taken place. In view of these things and in the hope that a condition other than malignant might possibly be present, I objected to immediate laryngectomy and with the consent of all sent the patient to the Memorial Hospital, New York, where after two radium treatments, applied at considerable intervals of time to the outside of the neck, all vestiges of the growth disappeared. Histologically, the growth had proved to be a lymphoma with no trace of malignance and the throat remained entirely normal for a number of years when the presence of a new growth, which was supposed to be malignant having been discovered in the stomach, the histology of the laryngeal growth apparently having been ignored, the patient was operated upon, only to find another development of the lymphoma, and died under operation (Case No. 2).

Duration: Dr. Delavan referred to two patients, both of whom exemplified the value of laryngeal surgery, both operated upon by members of the Academy of Medicine, and each in its way unique. Sir St. Clair Thomson reports a case of thyrotomy alive and well at the end of 19 years. Dr. Delavan presented Mr. B. F. M., operated upon at St. Luke's Hospital by Dr. B. Farquhar Curtis, who performed partial laryngectomy in 1897, 35 years ago. The life of this patient has since been one of unusual activity and success, with excellent voice and undaunted cheerfulness of spirit, as may readily be inferred from his remarks.

The second patient, a woman, at the age of 24 years developed a malignant growth of the interior of the larynx, which advanced until widely extrinsic. The larynx, with the affected outlying parts, was removed. The patient is alive and well today, at the end of 14 years (Case No. 3).

30 East 60th Street.

OUTSTANDING POINTS IN LARYNGECTOMY AS DEVELOPED BY MACKENTY AND SOME OF THE OTHER IDEAS RELATING TO THIS OPERATION.*

DR. FIELDING O. LEWIS, Philadelphia.

I esteem it a great privilege and honor to be invited to participate in this, a commemorative meeting, in honor of a distinguished laryngologist, one who possessed a personality of rare charm and a pleasing disposition, which impressed those with whom he came in contact. He was genial and unruffled, quiet and unostentatious, sincere and true. Throughout his professional life, he remained a student with a strong interest in the progress of his specialty. Dr. Mackenty's acuteness in observation, his rare judgment and his steadfast earnestness to his ideals brought him recognition at home and abroad, and, what is more, created a real impetus in the development of laryngectomy in America.

Well do I recall the occasion on which I viewed my first laryngectomy. It was about thirteen years ago at the Manhattan Eye and Ear Hospital, Mackenty was at his best, both as to his operative technique and his forceful denunciation of radium in the treatment of laryngeal cancer. None who heard him could for a moment doubt but that he himself was firmly convinced of the truth of all his statements, and that such belief was not born merely of intuition, but was founded upon prolonged observation of facts and their careful testing by direct experience. So impressed was I by his meticulous technique, that I ventured to embark upon the same field, attempting to duplicate the method which had given him such excellent results in the intrinsic form of laryngeal cancer.

The one-stage operation for laryngectomy, as described and practiced by Mackenty, was inspired by the brilliant work of Gluck, who was the first to publish his results following the use of this procedure. Mackenty has said, "The one-stage operation has always appealed to me since the tendency in general surgery, which I had practiced for many years prior to entering laryngology, was and is, toward dealing with any given disease

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by a single effort. The misery to the victim is surely minimized by so doing, providing the single effort can be shown to be as safe as its multiple substitutes." Among the outstanding points in total laryngectomy which Mackenty has repeatedly emphasized and which, in my opinion, often determines success or failure, is the finical care in determining the patient's general fitness to withstand a formidable operation and to survive what is often a prolonged and irksome convalescence.

One may be extremely clever as a surgeon, but in surgical judgment unsound.

A careful survey of the patient's cardiovascular system; investigation of his metabolism; attention to mouth infection; heedful as to paranasal sinus disease and scrupulous concern as to all details of the preparation of the patient are among the essentials not to be overlooked.

He was an advocate of combined local and general anesthesia, having noted the tremendous nervous strain and mental anguish that some of his patients had suffered, when only regional anesthesia was used, in which my experience coincides. Had he witnessed or used regional anesthesia combined with the rectal administration, in suitable patients, of avertin I am confident that he would have been delighted with the results. I have no certain knowledge but that this was perhaps the method lately used by him. The peaceful sleep, unhampered by the paraphernalia of the anesthesist, renders the handling of the trachea, as well as other structures by the surgeon, less difficult and all that is to be desired, and when administered by an expert, I have experienced no ill effects. It eliminates the necessity of using a tracheal extension tube, the presence of which has, at times, produced an annoying traumatic tracheitis.

When the growth encroaches on the lumen of the larynx to the extent of embarrassing respiration, the complete relaxation by any anesthetic is dangerous, as it invariably produces an alarming asphyxia, predisposes the patient to a possible pneumonia and calls for an emergncy tracheotomy, often at a time and place most inconvenient for the surgeon (I am speaking from personal experience), for this reason the operation under regional anesthesia up to the point of severing the larynx from the trachea is well advised in the Mackenty operation.

There have been described many forms of incisions through which the larynx may be removed. The T-shaped incision as used by Mackenty and others is especially useful, when the

disease is known to be confined within the larynx and there is no palpable evidence of glandular metastasis. The one great difficulty, as experienced by all who have used it, is to secure a primary union at the point where the two lines of the T cross, otherwise a hypopharyngeal fistula will result. In order to obviate this, Mackenty has emphasized the importance of using a parallel mattress suture, often with silver wire as the suture material.

When glandular metastasis is present or suspected, the tongue-shaped flap of Gluck with the base at the level of the hyoid bone or the quadrangular flap of Moure are preferred by some. By these methods, it is claimed that a better exposure to the subhyoid and carotid regions is obtained; that the incision in the skin is removed from the opening in the esophagus and thereby lessens the risk of infection from the pharynx and prevents the formation of a fistula. Still others prefer a modification of these, all of which have been used with satisfaction. Regardless as to which incision is used, the secret of its success depends on the proper closure of the wound and the institution of ample drainage after the larynx has been removed.

Special stress is placed upon the serious consequences which may follow the entrance of blood into the lungs during the operation and Mackenty's method of prevention deserves careful consideration. This was the bete noir of earlier surgeons. They were handicapped in not having the present day facilities for keeping the trachea free from blood and secretions during the operation. I should like also to emphasize that the same facilities have been an invaluable aid during the convalescent period, likewise reducing the mortality. In order to overcome this disadvantage, many operators, when possible, adopted the method of removing the larynx from above downwards and closing the pharyngeal opening before severing the larynx from the trachea. A method sound in principle and still used by many in suitable cases.

Mackenty states, "I am convinced that an apparently negligible amount of blood entering the lungs during the operation may cause grave consequences. It is, therefore, my endeavor to conduct the operation so that not one drop is allowed to pass down the trachea." To accomplish this result, a suitable suction outfit in the hands of a wide awake assistant, judiciously used, a closely fitting rubber tube introduced into the trachea, and the scrupulous vigilance of all concerned during the operation was impressively carried out.

All who are experienced in laryngeal surgery will attest to the importance of any method which will protect the lungs against invasion during an operation; especially is this true in laryngectomy, since the cough mechanism is impaired and the lungs cannot be completely cleansed. The method of Mackenty has no doubt been the means of saving many from fatal pulmonary complications.

Gluck is accredited as being the first to effect a complete separation between the air and food channels by closing the pharyngeal opening and transfixing the stump of the trachea to the skin. J. Solis-Cohen was the first to use this method in America. This should be carried out with the greatest concern, so as to secure an opening which does not necessitate the wearing of a tracheal cannula, after the convalescent period is over. This may be accomplished in different ways, by the submucous removal of the uppermost ring of the trachea so as to secure perfect union between tracheal mucous membrane and skin; an unnecessary labor. No harm results if the first ring of the trachea is included in the sutures, provided they are not tied too tightly, but exact approximation of the skin edges to the raw surface of the mucous membrane is essential. The stay sutures, as recommended by Mackenty, have their usefulness, if the peritracheal tissues have been freely dissected. They relieve tension on the sutures uniting the skin and tracheal mucous membrane and prevent the trachea from sinking too deeply into the chest. If, however, they are permitted to remain for more than two or three days, infection may occur with destruction of the tracheal ring and thereby delays healing.

The aim of every surgeon who performs a laryngectomy for intrinsic cancer of the larynx is to obtain healing of the wound by primary union, if possible. When accomplished, the convalescent period is reduced to about half the time in many cases. If local infection occurs with sloughing of the tissues, a large pharyngeal opening will result, which usually requires a plastic operation for its closure; or a septic infection may follow, if suitable drainage has not been amply applied. Even under the most favorable conditions, these complications will often, regardless of all precautions, take place. One of my patients developed a staphylococcic infection in the soft tissue of the neck, and in spite of all the means at our command to stop its progress, both clavicles were soon destroyed and a fatal termination from a septic mediastinitis took place in a few days. To anticipate and

dispose of these complications, Mackenty had developed a unique method of abundant drainage of the operated field. After exercising great care in closing the hypopharynx, a small double rubber tube drain wrapped in gauze is placed in each space at the ends of the crossbar of the T and in the spaces just above the tracheal skin incision, extending laterally to the full depth of the wound. The drains are so constructed that they may be left in position for four or five days, and may be adequately cleansed daily by gently forcing saline solution through them by means of a piston syringe and assisted, by the aid of a suction apparatus. The trachea is protected by a large tracheal cannula, which has been previously wound around with gauze impregnated with bismuth paste, and fashioned so as to resemble the form of a conical stopper, which is made sufficiently large to completely cork the trachea. Some operators prefer the use of a modified Lombard tube, so devised as to fit the trachea closely, with the added advantage of facilitating the change of dressings. Plain gauze or cigarette drains for the spaces to be drained and also the usual laryngectomy cannula should likewise receive consideration. It matters not which form of drainage or tracheal protection is preferred, drainage should be adequate and the trachea amply protected.

In the whole domain of surgery, there is no operation which requires greater vigilance and care on the part of the surgeon. Skilled assistants and nurses and a well equipped hospital are indispensable to the best interest of the patient.

Mackenty stated in a recent publication, "I attribute the prohibitive surgical mortality of a few years ago and even more recently to four causes; namely, careless selection and preparation of the patient, prolonged general anesthesia, the entrance of blood into the lungs during the operation and wound secretion afterward, and mismanagement of the local infection. Another factor may be added. Rectal feeding and drop feeding by the mouth were depended on prior to my demonstration, many years ago, that the esophagus would tolerate a permanent tube for weeks. Rectal feeding was one of the greatest fallacies that ever became rooted in the professional mind." Laryngectomized patients not only require excessive care in the small details as to drainage and protection to the trachea during the postoperative period, but they also demand a sufficient amount of nourishment.

Mackenty was the first to use a nasal feeding tube for laryngectomized patients. This method has, to my mind, been a great

relief to the suffering patient and the expectant surgeon. Some operators of large experience prefer passing the feeding tube through the mouth before suturing the pharyngeal opening and retain in position at one corner of the mouth by an anchor suture, for the first twelve or twenty-four hours. It is then removed and reintroduced for each feeding. In my experience, this method has produced far greater reflex disturbances and annoyances to the patient than the permanent nasal tube, as recommended by Mackenty. In operating for extrinsic cancer of the larynx, when primary closure of the pharyngeal opening is impossible and convalescence greatly prolonged before secondary plastic closure is advisable, it is my feeling that a gastrostomy performed a few days before the laryngectomy lessens the probability of a local or general sepsis or pulmonary complications.

Time does not permit the discussion in detail of all the outstanding points which Mackenty has developed in laryngectomy. I have tried briefly to mention a few. He sleeps on and through the years that will come and pass the technique of laryngectomy may improve, but the principles as propounded by Mackenty will remain conspicuous and lasting.

261 S. 17th Street.

ATRESIA OF THE PHARYNX AND OTHER PLASTIC OPERATIONS DEVELOPED BY DR. MACKENTY.*

DR. E. ROSS FAULKNER, New York.

The operation for atresia of the pharynx was first described by Dr. Mackenty in the *Medical Record* of Nov. 25, 1911, with a report of three cases operated on successfully; his later report with an experience of ten cases was published in the *Archives of Otolaryngology* of July, 1927, Vol. 6. This report included the description of another operation for atresia where attempts had been previously made and had rendered conditions impossible for the operation which he preferred. His clear, concise description of the original operation, with the excellent plates, is a model of its kind, and the technical steps are accurately described by Dr. Mackenty in his article, "Nasopharyngeal Atresia," published in *Archives of Otolaryngology*, Vol. 6, July, 1927, pp. 1-27.

I have seen Dr. Mackenty do this operation several times and can remember well the satisfactory results he had. He had devised as a dilator a cone-shaped piece of rubber mounted at right angles to a metal handle which could be used by the patients themselves. This ingenious surgical procedure was a great advance on previous methods for the relief of this distressing condition and would alone give its originator grateful recognition for having added to the beneficent surgical scope of our specialty.

I wish now to mention various other conditions where his activity was exercised, and in every field his experience added something to the advancement of knowledge. He devised a plastic operation for the relief of obstruction of the anterior nares and described a rational method for treating septal deformities in children. These were both described in the *Medical Record* of Nov. 25, 1911. An Operation for the Relief of Abductor Paralysis of the Larynx was published in the *Archives of Otolaryngology* in July, 1928. This consisted of the removal of a small portion of the anterior tracheal wall and uniting by suture the skin and the mucous membrane inside the trachea. This left a small permanent opening which constituted a safety valve and prevented any danger of asphyxiation. At the same time phonation could be carried on by closing the opening by an obturator or the finger. Another contribution to surgery was made by Dr. Mackenty in the operation for cleft palate. His experi-

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ence in this field included over two hundred cases. The complete description of his method in performing the operation can be found in a paper published in the *Archives of Otolaryngology* for November, 1929, Vol. 10. His original contribution to this procedure consisted of the employment of a flexible metallic band of either silver or lead which was used as a suture through lateral incisions and thereby relieved the tension on the cleft closure sutures. He also invented a wire frame obturator attachable to the alveolar processes which prevented strain on the sutures from tongue pressure. Apart from these devices which added greatly to his good results, the extremely careful attention to the details of after-treatment, the selection of the most propitious season for operating, *viz.*, Spring and early Autumn, when infections are less prevalent, were also factors which he considered of paramount importance. His work in this difficult field of surgery received wide recognition and many of his suggestions have been adopted as part of the orthodox standard procedure of modern surgery for the relief of these unfortunate cases.

I wish now to extend the subject of my address to mention a sphere of surgery in which Dr. Mackenty was always keenly interested; namely, sinus surgery. One has only to go back about twenty-five years to realize how few specialists at that time were capable of doing real surgical work on the sinuses, both intranasal and the more radical procedures. Very early in his career he began doing these operations, and with his splendid knowledge and experience in general surgery he was able to perform sinus operations with more boldness and thoroughness than most of his confreres. During the past twenty years he acquired a vast experience in this field and his fine technical skill with accurate knowledge of surgical principles rendered a high percentage of excellent results. He was especially interested in the correlation of sinus disease to eye complications and was a strong advocate of early diagnosis and operation where serious eye complications were associated with sinusitis. His experience in these correlated conditions covered about two hundred and fifty cases and the data compiled from accurate records of these cases have been recently published in the *Transactions of the Association for Research in Ophthalmology* of 1931. This article is by far the most comprehensive survey of this subject which has ever appeared and adds a great deal to our knowledge of a subject of great importance and one sadly in need of elucidation. His thorough exposition of the subject will no doubt remain a permanent part of our reference literature and most of the conclusions will be accepted as a part of our established convictions.

To such a brief citation of achievement as I have already made I wish to add that Dr. Mackenty was one of the pioneers in expanding the surgical field of our specialty. He always believed that a nose and throat specialist with a proper surgical training was the man to take care of neck surgery. He carried this out in practice and advocated proper training for all specialists to prepare them to carry on this wider sphere of surgical work. He himself always exemplified the great benefit which a fine general training renders a specialist. Such a training not only elevates and enlarges our sphere of usefulness but enhances our status in the profession as a whole. We owe to one who leads us in that broader way a great debt of gratitude.

To such a record of achievement as we have discussed here tonight I wish to add a little more personal observation. A physician's scientific attainments may not be the whole of his life's value. Dr. Mackenty's accomplishments in the science and art of surgery would entitle him to an enduring fame but, withal, he lived his life in perpetually manifesting the attributes of the great doctor. He always maintained a broad human sympathy and an unselfish devotion to the welfare of his patients of all ranks and conditions of life. The steadfast application to his daily work and his desire to advance in scientific knowledge were always inspired by a desire to relieve human suffering. To love truth for its own sake is a noble aspiration but to pursue the acquisition of truth that one may be helpful to others is a more excellent way and to that more excellent way was dedicated the life of John E. Mackenty.

101 East 58th Street.

DIAGNOSIS OF EARLY CANCER OF THE LARYNX.*

DR. CORNELIUS GODFREY COAKLEY, New York.

As with cancer in any other part of the body, the earlier the diagnosis is made the better is the prognosis, and the procedures for relief are simpler. In order to properly approach this subject I shall ask you to recognize that from the clinical standpoint, invasions of the larynx with cancer have been very properly classed as intralaryngeal and extralaryngeal. The intralaryngeal group are the more numerous. They originate on the vocal cord, in the subglottic region and in the ventricle. The extralaryngeal cases may involve the epiglottis or aryepiglottic fold. Some clinicians include in this group those which originate on the posterior surface of the cricoid. It would seem to me better to regard these cases as pharyngeal rather than of laryngeal origin.

Intralaryngeal Type: The most common seat for the invasion is the middle and anterior portion of *one* of the vocal cords; the next most frequent is the portion just beneath the vocal cord and, thirdly, the ventricle. It seldom appears first on a ventricular band. There is only one symptom in the early stage of intralaryngeal cancer, and that is an alteration in the voice. The voice at first is slightly husky, and may remain so for several weeks, gradually increasing and usually only after some months the patient loses his voice and becomes aphonic. There are often intermittent degrees of hoarseness. An intermittent acute laryngitis greatly increases the hoarseness, with an improvement in the voice as the acute laryngitis is recovered from. Inasmuch as in the early stages there is no pain, the patient does not apply for treatment of his hoarseness, or if he does go to his family physician he is given cough medicine and sprays to use, with practically no benefit. The next step is to be examined by a laryngologist, and it has been our experience that many of these patients have an application of silver nitrate to the thickened area of the cord, and this is often kept up for a period of from one to three months before a real diagnosis is made. No patient, 40 years of age or over, who has a slight hoarseness from which he does not recover completely in a couple of weeks should fail to have a thorough examination made of his larynx to determine accurately the cause of the hoarseness. Frequent causes of hoarseness are acute

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laryngitis, chronic laryngitis, hemorrhage into a cord, nonmalignant neoplasms, such as polyps, fibromata, vocal nodes and papillomata. Other causes may be gumma, tuberculosis and cancer. There is a type of ulceration involving the posterior portion of the cord, sometimes unilateral, and at other times bilateral, frequently associated with grippe, which may readily be mistaken for an early stage of cancer. In the case of an acute laryngitis of the ulcerative type, absolute rest to the voice for a period of from two to four weeks will result in disappearance of all evidence of inflammation without any local treatment. In the case of nonmalignant tumors, only one cord is involved, and the growth may readily be seen. These tumors are usually attached by a comparatively small base, the rest of the cord and the uninvolved cord are perfectly normal, and the motility of the cords unimpaired. The treatment of all of these nonmalignant cases is their removal either by direct or indirect methods, and we urge upon the operator to have every such specimen, particularly the papillomata, examined histologically to determine their precise nature.

This leaves us with the three conditions involving but one cord and which are sometimes difficult to differentiate between as a result of a laryngoscopic examination; namely, gumma, tuberculosis and cancer. In gumma the Wassermann reaction is positive; history of a primary lesion may or may not be obtained, and antiluetic treatment usually results in marked and quick improvement. In the case of tuberculosis there may usually be found on physical examination of the chest and by X-ray, evidence of tuberculosis. One must, however, bear in mind that it is possible for the patient to have a gumma and a cancer, or tuberculosis and cancer, at one and the same time. During the period of observation of any infiltration of one of the vocal cords, I enjoin absolute rest of the voice, all communications to be undertaken only in writing. If an investigation for lues and tuberculosis proves to be negative, one should be extremely suspicious that we are dealing with a case of cancer. During my earlier days I was taught that a great differential diagnostic point between cancer, gumma and tuberculosis was in the fixation of the vocal cord in cancer and not in gummata or tuberculosis. Our clinical experience over a number of years has proven this to be fallacious. In the early stages of cancer involving the anterior and middle third of the vocal cord, there is no impairment of motility of the invaded cord. A fixed vocal cord in cases where the laryngeal lesion looks small will be found on operation to be much more extensive than it is thought to be. In the event that, with rest to the voice, the lesion has not disappeared, I deem it absolutely necessary for a biopsy to

be made, with the definite understanding that if the section proves to be cancer an immediate operation should be undertaken. In all of my experience I do not believe that I have seen as many as ten patients on whom I could make a really early diagnosis of cancer, owing to the fact that the patients had failed to appreciate hoarseness or had been treated as above described by sprays and applications. A single history taken from my records is quite typical:

Dr. G. F. B., age 46 years, complained of gradually increasing hoarseness for ten months; loss of voice, at first only at intervals when tired, but practically complete aphonia for the past two months, no pain, dysphagia or cough, no general symptoms. Had been treated with temporary benefit with silver nitrate to larynx up to 10 per cent strength. Wassermann negative; case had been diagnosed as chronic laryngitis. When he came to my office the appearance of his larynx was much like what is shown in above chart with only slightly impaired movement of the arytenoid. The clinical diagnosis was cancer. Section was taken and microscopical examination as follows:

"The specimen consists of two pieces of tissue from the larynx, one about 1½ x 8 x 5 m.m., the other about 8 m.m. in diameter. Each presents a mucosal surface which is raised, rough, white, very firm in consistency; on section a white epithelial tumor; frozen section diagnosis: epithelioma. Sections—two microscopic examinations. The surface layer is intact, showing junction of squamous and glandular portion of the epithelium. In the deeper stroma there are many columns of actively growing stratified epithelial cells, with many also arranged in concentric formation with horny center resembling pearls. Diagnosis: epithelioma of the larynx."

On operation not only the vocal cord and ventricle, but much of the subglottic portion of the larynx was found to be involved. Until the lay people learn to appreciate the importance of hoarseness and are awakened to its seriousness when occurring in patients after 40 years of age, we cannot expect to very often make an early diagnosis of cancer of the larynx. Until laryngologists appreciate the necessity of desisting in the use of sprays and topical applications to the larynx for unilateral infiltrations and proceed to the differential diagnosis and if necessary secure a biopsy in any case with infiltration of the larynx, we must not expect to make an early diagnosis of cancer of the larynx. The blame that cancer of the larynx is not more frequently diagnosed early lies equally with the patient and the laryngologist.

Extralaryngeal Type: The extralaryngeal type involving the epiglottis. Here there is a thickening and irregularity in the outline of

the epiglottis which should be investigated along the same lines as indicated for intralaryngeal infiltration. The same may also be said for the invasion of the aryepiglottic folds. Invasion of cancer in the region of the posterior surface of the cricoid and the pyriform fossa are strangely far more common in women than in men. The first symptom is usually some slight difficulty on swallowing, accompanied by a feeling of fullness in the pharynx. Liquids pass down easily, but solids and semisolids with difficulty. The progress of the cancer in these cases is apt to be quite rapid. Laryngoscopic examination with a mirror often reveals little with the exception that one pyriform fossa is not quite as full as the opposite side. Collection of saliva or mucus in one pyriform fossa always means obstruction on that side. Invasion here undergoes ulceration rapidly, probably owing to the trauma produced by the passage of food. An X-ray examination of the patient after swallowing bismuth nearly always shows an obstruction and retention of some of the bismuth over the ulcerated areas. Direct inspection of the patient by esophagoscopy may show the extent of the lesion, but in my experience the patient is considerably bruised and the disease progresses more rapidly as a result of the bruising. Very early involvement of the lymph nodes in the neck as evidenced by their enlargement usually may be determined in these cases, whereas it is absent in the intralaryngeal cancer until a very late stage. While surgical treatment is the one best chance for intralaryngeal cancer, it is not proving very beneficial in the extralaryngeal cases, and the only hope of cure is the modern deep X-ray therapy for those types which are radium sensitive.

20 East 53rd Street.

THE CANCER PROBLEM AS RELATED TO LARYNGOLOGY.*

DR. HARRISON S. MARTLAND, Newark, N. J.

Cancer of the larynx will be discussed from the viewpoint of a general pathologist. A short sketch of the incidence, predisposing causes, classification, value of biopsy and the grading of laryngeal tumors will be given with a lantern slide demonstration of the gross appearance and microscopic findings of the various laryngeal neoplasms encountered in a large autopsy service including many specimens removed by Dr. Orton by laryngectomy, which I have had the opportunity to study.

In preparing this summary, I have quoted exensively from literature, and especially from the writings of St. Clair Thomson, Mackenty, Jackson, Pack and LeFevre, Hoffman, Hellwig and others.

INCIDENCE OF CANCER OF LARYNX.

St. Clair Thomson states that cancer accounts for 100 out of every 1,000 deaths. Every tenth person dies of it. Cancer of the larynx is, however, relatively rare. In every 100 deaths from cancer, 1.8 per cent have cancer of the larynx, and 21 per cent cancer of the stomach.

Pack and LeFevre in a survey of the incidence of malignant diseases at the Memorial Hospital in New York found that epidermoid cancer of the larynx comprised 5.3 per cent of all malignant tumors in the male and only 0.48 per cent of those in females, confirming the well recognized 10 to 1 ratio in the sexes.

Hoffman states that the mortality from cancer of the larynx in England and Wales during the year 1927 was 3.2 per 100,000, which figures cover only males. For the same year, in the United States the mortality was 0.8 per 100,000, covering both sexes. It is difficult to state with certainty but it would appear that cancer of the larynx was more common in England.

St. Clair Thomson further states that intrinsic cancer of the larynx is ten times more frequent in men than in women, but that it must be remembered women also have it. It is rare under 40 years of age and most common between 50 and 60 years. Extrinsic cancer, however, excluding the postcricoid form, is practically limited to men and only occasionally seen in women. The frequency of post-

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cricoid cancer in women (in one series, 83 cases in females and only 13 in males), often occurring rather early in life, is of great interest and its cause is not understood.

Pack and LeFevre found that the ratio of males to females in carcinoma of the larynx was 10.4 to 1, which agrees with the statistics of St. Clair Thomson. Females averaged five years younger than males. Of their cases of laryngeal cancer, 55 per cent occurred between the ages of 50 and 65 years, the greatest number from 60 to 64 years. Although rare in youth, cases have been seen from 16 to 18 years of age. The benign papillomas in their series showed a ratio of two males to one female, and these innocent growths occurred in patients who average 22 years younger than those with cancer.

PREDISPOSING CAUSES.

The direct cause of cancer of the larynx is unknown, as is the origin of malignancies in most other regions of the body.

For years it has been recognized and Ewing has repeatedly emphasized the importance of bad teeth, tobacco and syphilis as important factors in the causation of cancer of the lip, mouth, cheek and tongue. Sharp teeth, ill-fitting plates, tobacco burns in cancer of the lip, and the leukoplakia of syphilis are more or less directly responsible for the chronic irritation which leads to these forms of cancer.

In searching for similar types of chronic irritation as the predisposing cause of cancer of the larynx, one must seriously consider the possibilities of vocal abuse, the irritant effects of tobacco, and the habit of ingesting hot drinks and food.

Jackson believes that over 64 per cent of his cases gave a history of undoubted vocal abuse. It is his opinion that precancerous lesions are very important and that cancer rarely appears in the normal larynx. Chronic laryngitis, keratoses, papillomas, granulomas, etc., all form favorable soil.

Other authorities do not emphasize precancerous lesions, and it is remarkable how unusual it is to see the benign papilloma become malignant.

The great majority of intrinsic cancers are situated on the free edges and superior surfaces of the vocal cords, at a location where the cords most closely approximate during phonation. A certain analogy may be seen in the formation of the rheumatic verrucae along the closure lines of the mitral and aortic cusps. Both form where the opposing cords or cusps meet and where mechanical injury and irritation is the greatest.

Hoffman states that in cancer of the larynx smoking habits play an important part. There has been no great increase in cancer of the larynx, however, notwithstanding the greatly increased use of cigarettes in the last 15 years. In fact, cigarette smoking seems to be less dangerous than pipe and cigar in the production of cancer in the buccal cavity and larynx.

It will be interesting to note any increase in laryngeal and buccal cancer in women during the next decade, as they have already approached and often exceed the males in tobacco excess. Vocal abuse is also by no means rare.

The habit of swallowing very hot drinks and food is also not without danger, and may form a possible explanation of the high incidence of postcricoid carcinoma in women.

CLASSIFICATION OF CANCER OF LARYNX.

Cancer of the larynx is usually classified as intrinsic, subglottic, extrinsic and mixed forms, depending on the situation of the growth.

INTRINSIC CANCER.

Intrinsic cancer is by far the most common form of laryngeal carcinoma, occurring in about 70 per cent of the cases.

The vocal cord is the favorite site of origin of the cancer and, practically speaking, intrinsic cancer is a *chordal cancer*. The growth usually starts in the middle third or anterior two-thirds of one cord and extends over the long axis. It almost always infiltrates anteriorly, and encroaches upon the posterior third only when extensive. Spreading to the anterior commissure it usually becomes subglottic and may invade the opposite cord by this route, or it may cross directly over to the opposite cord at the commissure. If large, it may invade the base of the epiglottis and become extrinsic.

Chordal cancers do not usually involve the lymphatics as long as the growth is confined to the cords. This is due to the fact that the cords have a very poor lymphatic supply. The horizontal, anatomical area occupied by the cords acts as a watershed, the lymphatics increasing in number as we leave this area either in an upward or downward direction.

Cancer originating on the ventricular bands or in the ventricles form only 5 to 10 per cent of the intrinsic cancers. They are more dangerous than cord cancers because early invasion of the lymph nodes along the jugulars may occur.

Intrinsic cancers almost never arise in the posterior commissure or in the interarytenoid tissues.

To summarize, we may state that intrinsic cancer is comparatively benign in its early stages. It grows slowly and does not infiltrate

rapidly. As long as the disease is limited to the vocal cords it does not metastasize to the lymph nodes. The carcinoma is almost always a squamous-celled epithelioma. Occasionally a basal-celled epithelioma is seen. Other forms are rare. Adenocarcinomas may be encountered in the ventricles. The course of cordal cancer is usually over several years, depending on location and grading of tumor. Biopsy does not seem to spread the growth and is practically without danger. Even the most malignant forms usually last over two years after recognition.

SUBGLOTTIC CANCER.

Subglottic cancer originates on the inner edge and under-surface of the vocal cords, or in the subglottic area.

Those originating on the cords are, strictly speaking, intrinsic cancers which become subglottic due to the direction of their growth.

The true subglottic cancers arise usually in the anterior one-half of the larynx below the vocal cords.

Subglottic cancers may spread over a large area before recognition, and this constitutes their chief danger. They are practically always squamous-celled epitheliomas. Usually, the lymph glands escape as long as the growth is confined to the interior of the larynx, due to resistance of the cartilaginous walls and the poor lymphatic drainage. However, they frequently pass through the cricothyroid membrane and metastasize to the lymph nodes over this area, often extending behind the isthmus of the thyroid. When extensive they may even pass into the trachea below.

Posteriorly, they may extend to the arytenoids and invade the pharyngeal mucosa, where rapid extension to the lymph nodes along the course of the internal jugulars takes place.

Superiorly, they may even extend into the larynx and invade the base of the epiglottis.

EXTRINSIC CANCER.

The common types of extrinsic cancer are those arising from the epiglottis, the aryepiglottic folds, the arytenoids, the pyriform sinuses and the pharyngeal surface of the cricoid cartilage, respectively.

They are almost invariably typical squamous-celled epitheliomas, but may be decidedly papillary in character. Basal-celled carcinoma occurs occasionally.

The extrinsic cancers invade the lymph nodes early and constantly. Those arising on the epiglottis, however, due to cartilaginous resistance, grow more slowly until the cancer invades the base of the tongue or aryepiglottic folds, when they behave in the same malignant manner as the growths in the other pharyngeal situations.

Extrinsic cancer, therefore, is a fatal disease; the lymph glands are affected early; the course of the disease is rapid, usually not lasting over a year and a half; and surgery seldom arrests or cures it. Usually such cases are gladly turned over to the radiotherapeutist, although a few surgeons will perform extensive mutilating operations in a vain hope of saving life.

It is of importance to note that Dr. Mackenty had the great wisdom to recognize early the difference in malignancy between intrinsic and extrinsic cancer of the larynx, and to confine his surgery practically to the cure of intrinsic cancer.

MIXED FORMS.

Many cases of laryngeal cancer present themselves in such an advanced stage of the disease that it is often quite impossible to state clinically, even after a careful examination of the pathological specimen, the exact site of their origin.

Sir Morell Mackenzie believed that the common site of laryngeal cancer was from the ventricular bands and ventricle, instead of the vocal cords. The erroneous opinion of this great authority was undisputed for many years. His belief was due undoubtedly to the fact that he saw many cases in an advanced and neglected state.

All forms may, therefore, be encountered. We have extrinsic cancers becoming intrinsic; intrinsic becoming extrinsic; and subglottic cancer becoming intrinsic, and vice versa.

BIOPSY.

The removal of portions of tissue from the body during life for diagnostic purposes is not a new procedure.

Hellwig in his comprehensive review of the biopsy, credits the famous Danish pathologist, Hannover, for realizing its importance, in the middle of the last century; and Ruge in 1888 for introducing biopsy into the clinical laboratory as an indispensable routine method. Ruge warned clinicians not to wait for help from the professors of pathology, who were isolated in their special institutes performing autopsies, but to develop the art of biopsy independently by microscopic investigation in their particular field.

The invention of the freezing microtome and the advantages of immediate microscopic examination during operations brought out by Wilson in 1905 quickly placed methods of biopsy on a firm basis.

Nevertheless, the pros and cons of the danger of biopsy form an extensive literature. It is of interest, from the standpoint of laryngologists, to note that Virchow in 1888 strongly emphasized the uncertainty of biopsy and warned his confreres against it. He was undoubtedly influenced by the tragic role that biopsy had played

in the case of Emperor Frederick II of Germany. Three specimens of tissue which were excised at different times had been submitted to Virchow, and on all three occasions he failed to recognize their true nature, while the surgeons had already made the diagnosis of laryngeal cancer.

Wood, from his experimental studies and clinical experience, concluded that in most tumors there is very little danger from biopsy when properly performed. The gentle massaging of tumors, however, is very apt to produce metastasis.

Wood further pointed out that, even today, at least half of the malignant tumors occurring are so inaccesible that in no sense can an early diagnosis be made. He states that even the accessible tumors are diagnosed so rarely in their early stages that only about 20 per cent of them are susceptible to operative treatment with a probability of cure. Inasmuch as a tumor easily diagnosed by the classic textbook symptoms is in most instances beyond the possibility of permanent relief, and as those in which effective intervention may be expected to offer cure are often in the stage in which the clinical diagnosis cannot be made with certainty, he concluded that the pathologist is assuming a position of importance which he has not held since the diagnosis of tumors began.

Hellwig very sanely states that from the conflicting opinions of various authorities it would seem that any general acceptance or condemnation of biopsy cannot be made. Each organ, he declares, offers a special problem and the wisdom of resorting to probatory incisions must be determined for each particular case.

As to the importance and dangers of biopsy in laryngeal growths, a few opinions may be quoted.

Hellwig quotes Tucker as stating that in intrinsic cancer of the larynx, early diagnosis offers a lasting cure in from 70 to 80 per cent. This is a much higher percentage of cures than can be obtained in cancer in any other location in the body. It is, therefore, imperative that every physician should know the symptoms, appearance and means available for the accurate diagnosis of incipient carcinoma of the larynx. In every case of early laryngeal cancer, the conclusive diagnostic step should be biopsy. If the result is negative, repeated specimens should be taken at proper intervals, and under aseptic precautions, until conclusive evidence is obtained.

Sorenson reported that he never performs a radical laryngeal operation before the suspicious tumor is proved to be a carcinoma by microscopic study. In his large material he has never observed a

malignant transformation or an aggravation of growth that could be attributed to biopsy.

Ewing stated that he had never seen an aggravation of malignant tumors following this procedure, but that several sections are sometimes required to locate the tumor.

Bloodgood believes that biopsy is essential in all early lesions of the larynx.

Crawford examined a number of larynges removed by Lewis and could not find any metastasis as the result of biopsy, although in many instances the patient had refused laryngectomy for several months following a positive report.

Jackson has never seen any ill effects due to diagnostic excision of laryngeal, bronchial or esophageal tumors.

GRADING OF TUMORS.

For many years pathologists have based their interpretation of the benign or malignant qualities of tumors on their ability to mimic normal tissues or to grow in a wild, lawless, anaplastic manner.

Since the development of modern surgical pathology, and especially the work of McCarty and Broders, it was soon found that it was distinctly advantageous to grade a tumor and give it a number which would be of use in determining its liability to recur and form metastasis. The grading of tumors, therefore, has been in use by most investigators of cancer during the last ten years.

The following table illustrates the interpretations used by Broders, the original or modifications of which are in use by most workers:

GRADING OF TUMORS—BRODERS' METHOD.

Grade	*Differentiated*	*Undifferentiated*
1	75 per cent	25 per cent
2	50 per cent	50 per cent
3	25 per cent	75 per cent
4	25 to 0 per cent	75 to 100 per cent

By differentiation we mean the ability of the tumor to resemble and mimic the normal tissue from which it originates.

The importance of grading laryngeal tumors will be realized upon consideration of a group of cases reported by St. Clair Thomson. In 60 cases of intrinsic epithelioma of the larynx treated by laryngofissure, and graded by the pathologist independent of their clinical histories, recurrences took place in only 6.6 per cent of Grade 1 Tumors; in 26 per cent of a combined Grade 2 and Grade 3 groups; and in 72 per cent of those graded as Grade 4.

In this respect it should be emphasized that in certain portions of the body, for instance, the bladder, papillomas frequently occur which mimic normal tissues and would be graded as histologically benign, yet such tumors are clinically malignant. In such growths grading is of little importance. The general principles, however, as stated above, are usually correct for most tumors.

After the grading of tumors had been in vogue for some time, it was noted, especially by those in large cancer institutions using irradiations, that carcinomas are resistant to irradiation in inverse proportion to the degree of anaplasia. In other words, neoplasms which are histologically highly malignant and graded as Grades 3 and 4, are more susceptible to destruction by radiations or more radiosensitive than those which mimic normal tissue and have a lower grade of malignancy (radioresistant). This became so important that the grading of tumors is now regarded as of still greater value than it was in the exclusively surgical era.

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CHOLESTEATOMA.*

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Introduction: Cholesteatoma is a tumor of more than special importance to otologists. In spite of this, its clinical ramifications do not receive the recognition they warrant in general medicine, in neurology and among those who are interested in morbidity studies from the standpoint of life insurance.

During the course of the development of cholesteatomatous growths, the patient presents symptoms which remain an unexplained or misunderstood feature of the clinical picture unless they are correlated to the insignificant chronic otorrhea with which he may have been afflicted for years. Naturally the relief of these symptoms cannot be effected until the relationship of the general signs to the otoscopic findings is understood. The same may be said of neurologic signs and symptoms. Here, too, the specific symptomatology may be summarized as a brain tumor whose original location neurology has definitely established and an adept in intracranial surgery may be called upon to search for and remove it; yet, unless the objective signs and the clinical symptoms are studied in relation to the rather insignificant otorrhea of long standing, the patient will not be cured. On the other hand, when a correlation is established between the otitic findings and the signs given by the impeded nerve tracts and the symptomatology is viewed as one clinical entity, then more gratifying end-results will be obtained from surgical therapy.

Cholesteatoma is a rather rare finding at the autopsy table and it has therefore escaped the attention of general pathologists. It grows and develops without sensational warning and in its terminal stage presents lesions of such grave and dramatic import that at necropsy the pathologist is prone to center his report on these with scant attention to the original tumor which grew into the middle ear spaces, became infected by pathogenic organisms and ultimately caused death after a severe clinical reaction which overshadowed the otoscopic findings. It is frequently for the relief of the grave secondary clinical signs that the patient is hospitalized. Only when these symptoms are understood in relation to the otoscopic findings can the terminal

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picture be recognized as the inevitable result of infection of a cholesteatomatous mass.

Often people carry cholesteatomatous tumors of small size for an indefinite period of time without realizing their significance. The growth has as yet reached no vital structure in the temporal bone or the intracranial cavity; the only symptom is an otorrhea of varying degree, sometimes barely present, and the patient has no realization that the small growth which gives such insignificant signs of its presence carries with it a distinct threat to life.

Even examiners for life insurance companies have not yet generally accorded this condition the recognition it merits from the standpoint of estimating longevity. Because the clinical picture in the terminal stage is that of an intracranial lesion and the cholesteatoma in the ear is not recognized in its etiological relationship to the terminal lesions and the records do not reveal the cholesteatoma as the actual cause of death, those interested in mortality rates have few actual figures with which to compute the influence of these tumors on longevity.

All chronically discharging ears are not due to cholesteatoma and the differential diagnosis is not difficult. It should and can be made; and those applicants for life insurance policies who have cholesteatoma should not be insured until the ear condition has been rendered safe. This is not an impossible condition. An ear affected with a cholesteatomatous growth can be rendered safe and the threat to life removed, as I shall presently indicate. When this is done with a fair degree of frequency, a distinct advance in preventative clinical medicine will have been achieved.

What Is Cholesteatoma? Under the designation "cholesteatoma" we include all globular growths which are surrounded by a thin shell of epidermis and connective tissue and which are composed of accumulated horny, desquamated epidermis. In order better to comprehend why the otologist, more than workers in any other field of medicine, is interested in this tumor and understands its ramifications, it is advisable to dwell upon its history.

The first two cases of cholesteatoma were described by Cruveilhier, who called them pearly tumors. He found both located in the meshes of the pia-arachnoid and, since he found no evidence of organization in them, he considered them the products of secretion. The name cholesteatoma was first given to these tumor masses in 1838 by Johannes Müller. The first case of aural cholesteatoma was described by Pappenheim the following year. Toynbee reported another in 1850, and reports by Rokitansky and Virchow followed.

It was Virchow who gave the first explanation of the nature and origin of this type of tumor mass. In his opinion the epidermoid cells of the cholesteatoma were derived from connective tissue and, consequently, he classified them among the heterologous tumors. This view, however, was eventually discarded, to be followed by Benecke's, Nehrkorn's and Borst's explanation of the endothelial origin of the cholesteatoma tumors found in the meninges. Another opinion was advanced by Böttcher, who believed that the cholesteatoma sprang from the epithelium of the aqueductus vestibuli. Mikulicz, in 1879, was the first pathologist to come forward with the idea that cholesteatomatous tumors arose from an embryonal rest of epidermis. The frequent occurrence of cholesteatoma in the temporal bones became comprehensible under this theory, since the pinching off of an epidermal anlage in the embryonal sutures is a possible occurrence during the developmental stage of the structures of the middle ear. This view is the accepted one today; namely, that a *true cholesteatoma* is a heterotopic new growth which develops from a congenitally misplaced epidermal anlage.

Up to this point, all the evidence as regards cholesteatoma was forthcoming from pathologists. It was inevitable that the frequency with which cholesteatoma occurred in the temporal bone should attract the attention of otologists. Gruber, Tröeltsch, Wendt, Haberman and Bezold all advanced the theory that cholesteatoma was not a true tumor formation but a product of inflammation. They substantiated this viewpoint with their clinical observations and studies in cases of aural cholesteatoma. Their theory led to the division of cholesteatoma into two main types; the true cholesteatoma, described by the pathologists and originating in a congenitally misplaced epidermal anlage, and the pseudocholesteatoma resulting from inflammatory reaction. Both views as to the genesis of cholesteatoma are now accepted by pathologists and otologists.

The only moot question that remained was the frequency of occurrence of the two forms, considering both their occurrence *per se* and their relative frequency with respect to each other. Ulrich, in Siebenmann's Clinic, did not find a single case of cholesteatoma of a true congenital nature among 458 cases which he studied. Another question that interested pathologists and otologists alike was whether or not these two forms could be differentiated pathologically.

The structure of a true cholesteatoma is a very simple one. The tumor mass consists of concentric, polygonal lamellae, composed mostly of epidermoid cells which are devoid of neuclei. Between these lamellae are found cholesterin crystals in greater or lesser

quantity. The whole mass is surrounded by a membrane called the "cholesteatoma matrix." This is composed of two layers, an outer and an inner one. The outer one, by which it is attached to the bone upon which it grows, consists of connective tissue, poor in neuclei but rich in blood supply, and contains elastic fibres. The inner layer is identical in structure with the epidermis of the skin and is in fact epidermis.

If we now compare the pathological findings in true cholesteatoma with those in pseudocholesteatoma, we see that no recognizable difference exists. Pseudocholesteatoma also presents a tumor mass surrounded by a matrix. In most instances, this matrix does not entirely surround the cholesteatomatous mass and at one time this difference was advanced as a means of distinguishing between the true and the false type. However, Manasse and Ulrich have described cases of pseudocholesteatoma in which the matrix did completely surround the tumor. It was then suggested that cholesterin could be isolated only from the true cholesteatoma, and not from the false, but this has also been disproven. Finally, it was held that elastic fibres are present only in the true cholesteatoma (Grünwald, Link), a point of view which also has been discarded since Ulrich demonstrated elastic fibres in twelve cases of pseudocholesteatoma which he examined postmortem. In all, on histological grounds, there is no evidence available to distinguish between the two types of this tumor. This is an extraordinary fact, hardly understandable from the viewpoint of general pathology because both types of tumor are the end-result of distinctly different pathological processes.

Differentiation between the two types can be made only as follows. We consider all cholesteatoma as true cholesteatoma when the tumor is located in a place that is not in topographical anatomical relationship with the middle ear spaces and when searching examination fails to show that there has ever been a suppuration of the middle ear spaces. However, it is conceivable that a true cholesteatoma may be present in the middle ear spaces and become secondarily infected. In very young individuals, a large size cholesteatomatous tumor suggests the belief that the origin is congenital, since the pseudocholesteatoma grow very slowly and only begin to develop after middle ear suppuration has been present for some time. A true cholesteatoma is also to be suspected when the tumor shows a widespread growth within the cranial cavity because, had an infection preceded the appearance of the tumor, it would have brought about a lethal intracranial complication before the intracranial growth had attained such large proportions.

As regards the frequency of occurrence of the true cholesteatoma, the literature yields but very few cases. Schwartze, Lexer, Körner, Erdheim, Manasse, Beyer and Mondschein are the only ones who have reported true cholesteatoma in any relation to the middle ear. True cholesteatoma of the middle ear space has until now not been discovered. We must therefore conclude that the true type of cholesteatoma of congenital origin in the temporal bone is extremely rare: clinically, we do not find it. On the other hand, cases of cholesteatoma within the cranial cavity have been discovered by Frank, Borchardt, Nehrkorn, Hedinger and Lexer. Nevertheless, even among these the intimate relationship of the tumor mass with the temporal bone is adduced from the fact that it seems to have a special predilection for the cerebellar pontine angle, close to the temporal bone.

We now come to the more detailed consideration of the second type of tumor, called pseudocholesteatoma. This is the one with which I will deal in more detail because it is the one which is most frequently found in clinical practice. For a thorough comprehension of the evolution and development of a pseudocholesteatoma, a full appreciation of the factors concerned in the process of pneumatization of the temporal bone is necessary. Likewise, the elements which inhibit and prevent the usual normal process of pneumatization must be understood. A detailed description of these factors is beyond the scope of this paper and time does not permit me to undertake it. If any of you desire to acquaint yourselves fully with this fascinating study, I refer you to the classical and basic work of Wittmaack.

For the comprehension of what is to follow it is merely necessary that I outline the Wittmaack theory of pneumatization of the temporal bone and I ask you to bear with me, under the circumstances, if my statements seem didactic when I present the present status of our knowledge upon this topic.

All mastoid processes are normally destined to become pneumatic. However, certain occurrences in the early days of infancy may enter into the situation and cause a disturbance of this usual and normal development. What is of particular interest to us here is the fact that the entrance of a foreign substance, such as meconium, vomitus or vernix caseosa, into the middle ear space during childbirth will bring about a condition which persists throughout the life of the individual. This condition consists of a hyperplasia of the tympanic mucosa, the formation of numerous adhesive bands in the middle ear and the failure of the mastoid process to become pneumatized or contain air cells. The end-result is the formation in the mastoid

process of hard, nonpneumatic bone, which we term sclerotic. In other words, the mastid process shows sclerosis.

With these facts in mind, we divide pseudocholesteatoma into two types. One is called the primary and the other the secondary. Here also the differentiation is not a pathological, but rather a genetic one. Let me digress for a moment. It is an accepted fact that in certain types of chronic purulent otitis media the squamous epithelium of the external auditory canal grows into the middle ear and replaces the mucous membrane which normally is found in this area. This type of middle ear suppuration has been termed the chronic transformative type of middle ear suppuration. Here the ingrowth of epidermis from the external auditory canal into the middle ear represents Nature's effort to heal the lesion. The ingrowing epidermis spreads over the middle ear space and replaces the diseased mucosa with a healthy membrane. Healing results when the diseased membrane is completely replaced with healthy epidermis which remains in contact with the outer air through the opening in the drumhead which originally gave the ingrowing squamous epithelium access to the tympanic cavity.

The primary type of pseudocholesteatoma is distinguished from the chronic transformative type of middle ear suppuration and also from the secondary type of pseudocholesteatoma by the fact that no acute necrotic inflammatory process precedes its development. In accordance with the Wittmaack theory of pneumatization, the primary type of pseudocholesteatoma can develop only where a definite, preformed, anatomical foundation exists; and this foundation is always the result of a hyperplastic type of infantile otitis. When the necessary anatomical basis is present and the adhesive bands which run across the tympanic cavity from the drum to its inner wall are so situated as to separate completely the tubotympanic space from the epitympanic space and antrum, we then have the essential factor for the production of a primary pseudocholesteatoma. The air, which is present in the closed off epitympanic and antral space, becomes absorbed and the negative pressure thereby created causes a marked retraction inward of the thin upper portion of the drum, known as Shrapnell's membrane. This retraction continues until the tension is so marked that the thin membrane is drawn inward against the walls of the closed cavity. Usually the retraction is so marked and the air pressure so decidedly negative as to cause this part of the membrane to rupture. We then have a highly abnormal condition presenting itself: a strange epithelium, epidermis, attaches itself to the walls of the recessus epitympanicus, which should normally be lined

with mucous membrane. Due to the marked irritation of this foreign membrane by the negative pressure, the blood supply of its subepithelial layer is markedly increased; and since, in addition, it is attached to a submucosa which is even richer in blood supply than its own, a rapid proliferation of epidermal growth occurs. The rich vascularization produces a more vigorous growth of the germinal layer of the epidermis which, in turn, causes an increased amount of desquamation of its hornified cells.

This is the first factor in the development of the primary type of pseudocholesteatoma. The second step is concerned with the opportunity which is afforded for a free egress into the external auditory canal of the products of the desquamated epidermis. Since the opening into the recessus epitympanicus which has resulted from the inward retraction of Shrapnell's membrane is a very small one, and since the rate of desquamation of hornified epidermis has been very much increased, the avenue of escape for the latter is inadequate. Consequently, within this small space of the recessus epitympanicus which is now lined with epidermis, there occurs a retention of the desquamated cells. This retention, with its resultant pressure upon the bony walls, is the second element in the growth of cholesteatoma.

The result of the abnormal pressure exerted upon the bony walls brings forth still a third factor in the growth of the tumor mass. Whereas the first two factors are to be regarded as mechanical in nature, this one is biological. It is readily understood that the pressure of the cholesteatomatous mass against the epidermal membrane which is now termed the cholesteatoma matrix is in turn exerted against the subepithelial nutritive layer. Since the surrounding bone to which it is attached is not a yielding substance, the death of this matrix must soon occur because of the occlusion of its blood supply. Consequently, a new source of supply must be furnished the matrix. This is readily accomplished. The mechanical pressure calls into play the connective tissue of the perivascular spaces within the bone. Very shortly, this proliferates and forms foci of bone resorption, which soon come into direct contact with the cholesteatoma matrix, thus assuring it of nutrition. These resorption foci are the direct cause of the enlargement of the bony cavity, since they surround the bony margins of the cavity, shut off the blood supply from this area to the bone and cause the bone to be absorbed. It will thus be seen that it is a combination of mechanical and biological factors which is responsible not only for the genesis of the primary pseudocholesteatoma, but also for a continuation of its growth and the bone absorption which surrounds it.

In the secondary type of pseudocholesteatoma there is an additional factor which paves the way for the development of the tumor. Here also a definite, preformed, anatomical foundation is required for its development; namely, that type of mucosa and mastoid process which results from the hyperplastic type of infantile otitis. In addition, however, suppuration now plays an important role. This type most frequently occurs following an acute necrotic otitis media, such as is often present in cases of scarlet fever. Here a mass necrosis of the drum and tympanic mucosa results; and Nature, in its efforts to cure the lesion, causes the epidermis of the external auditory canal to grow into the middle ear space and line it with a healthy epithelium. Where such a condition exists, the formation of the secondary type of pseudocholesteatoma depends solely upon whether or not adequate drainage is afforded the desquamated epidermis. Where the hyperplastic infantile otitis has resulted in a complete fibrous or bony occlusion of the recessus antri and the antrum, the ingrowing epidermis is not able to enter this space and consequently grows over the exposed connective tissue which fills it until finally the entire tympanic cavity is lined with epidermis.

This, then, is the status of a cured lesion of the chronic transformative type of chronic purulent otitis media. Clinically, all otologists are familiar with it. On otoscopic examination we find a large marginal type of perforation, sometimes with a complete absence of the drum; and, through this opening, the inner tympanic cavity is seen covered by glistening epidermis. There is no evidence of any suppuration, for this has long since subsided.

On the other hand, where the recessus antri and the antrum have not been obliterated by the fibrous or bony formations resulting from the hyperplastic type of infantile otitis, the epidermis will grow into the epitympanic space and line it as well as the walls of the tympanum. The similarity between this lesion and the primary type of pseudocholesteatoma is apparent; here, too, we have a small space with an inadequate avenue of escape for the desquamated products of the ingrowing epidermis. This leads to the accumulation of cholesteatomatous material in a tumor-like mass with subsequent pressure on the bony walls and the eventual formation of resorption foci in the underlying bone exactly as occurs in the primary type of pseudocholesteatoma. Such, briefly, is the pathogenesis of cholesteatoma.

Diagnosis: Clinically, we are not concerned with true cholesteatoma because it is so rarely met. The pseudocholesteatoma, on the other hand, is a growth of relatively frequent occurrence; and all

practicing otologists encounter it. Recognition of the pseudocholesteatoma presents no difficulties; and its cure is also simple provided that it comes under observation and control before it has involved vital structures in its growth.

Fortunately, this tumor mass in itself is not malignant. It does not threaten life except when it grows into vital cranial structures. It never produces metastases. Its elements of malignancy, if they be termed such, reside in the fact that its growth is exceedingly slow and its progress toward the endocranium insidious. Except for symptoms from the ear itself — that is, the persistence of a foul-smelling otorrhea—the patient has no warning of its presence. Accordingly, in cases that are not under competent observation, the existence of a pseudocholesteatoma may remain undetected until the patient presents general signs and symptoms which take him to a physician. Since these symptoms are usually caused by encroachment of the tumor mass upon some intracranial structure, the lesion is then grave.

The clinical picture at this stage is that of the complication; the signs and symptoms are those of the secondarily involved structures. The labyrinth may be involved or the brain itself; or the tumor may have extended in such a way that the large blood channels or the meninges are the seat of a lesion whose dramatic and stormy clinical signs overshadow and obscure the symptoms from the tumor which is etiologically responsible for the entire situation.

In the great majority of cases wherein we deal with pseudocholesteatoma the disease is of the secondary type, characterized by an inflammatory lesion of the middle ear and a persistent otorrhea. The latter is a warning sign which should bring the patient under observation. No case of persistent otorrhea should go without periodic observation and study by a competent otologist; and in every such case an effort should be made to determine the presence or absence of cholesteatoma as a factor in the chronically discharging ear. Every patient who suffers from attacks of dizziness and vertigo should be carefully studied with a view to discovering whether there is or ever has been an aural discharge. If a middle ear suppuration is found, the otologist is in a position to determine the presence or absence of a cholesteatoma. Even where there is no ear discharge present at the time of examination, a patient who has symptoms suggestive of labyrinthine or cerebellar irritation or who presents signs that are characteristic of a pontine angle tumor should have his entire history painstakingly scrutinized for information as to previous attacks of suppurative otitis media. If such an inquiry into

the history gives reason to suspect an aural discharge, even considerably prior to the symptoms currently demanding medical attention, the patient should be studied otologically and Roentgenographically to determine the presence or absence of cholesteatoma.

When examining applicants for life insurance, an examination of the ears should always be made, for not much reliance can be placed upon a layman's statements as to the health of his ears. If an ear discharge is acknowledged by the applicant, or if one is found upon otoscopic examination, the necessary steps should at once be undertaken to determine the presence or absence of cholesteatoma for this lesion constitutes a distinct risk from the standpoint of life insurance. The hazard is not an insuperable one, however, for under suitable treatment the threat to life which is potential in all cholesteatoma can be obviated. The lesion can be eradicated and the patient rendered safe.

Of the two types of pseudocholesteatoma, the primary tumors are the more dangerous, since there is no otorrhea nor history of an aural suppuration to point the way to the lesion. As a result the growth may develop to large proportions before giving symptoms to indicate its presence. By this time intracranial lesions are already established.

We will consider the clinical picture of the secondary type of pseudocholesteatoma first since it is the more common variety. The history is usually that of an aural discharge of long standing. Most patients will tell you that their otorrhea was brought on by an attack of scarlet fever in childhood and that since then the ear has been draining persistently. Otoscopic examination will reveal a marginal perforation which varies in size in different cases. In most instances, the drum has been completely destroyed. Further inspection reveals a foul-smelling discharge. When this is completely wiped away and the middle ear thoroughly cleaned out, the inner tympanic wall will be seen lined with a glistening membrane which is immediately identified as epidermis.

It is important to distinguish between the ordinary transformative type of chronic purulent otitis media and a secondary pseudocholesteatoma. This can be done by determining whether or not the recessus antri and antrum constitute a patent space. An attic probe is inserted into the middle ear and pushed up into the attic and antrum behind the outer attic wall. If a patent space is found, there is a great probability that a cholesteatoma is present. When, in addition, cholesteatomatous masses can be brought down from the attic, the diagnosis is almost certain. These masses appear as white, cheesy

material which comes away in clumps and has a different consistency than pus or mucopus. If they are examined under the microscope, they will be seen to consist of dead polygonal epidermoid cells devoid of nuclei, between which are many cholesterin crystals and fat particles.

The presence of a cholesteatoma can be established with further certainly by subjecting the suspicious masses to a chemical test, which has been described by Lautenschlager and by Retjo. The technique of this test is as follows. With the aid of an attic syringe, 2 ccm. of carbon tetrachloride are injected into the recessus antri and allowed to remain there from 10 to 15 minutes. This is then aspirated and a sufficient amount of carbon tetrachloride is added to bring the quantity up to 4 ccm. After this is filtered, carbon tetrachloride is again added to bring the quantity up to 5 ccm. To this are added 2 ccm. of glacial acetic acid and three drops of concentrated sulphuric acid. The mixture is shaken and placed in the dark. When a cholesteatoma is present, a characteristic green color, closely resembling naphthol green-B, appears in fifteen minutes.

Still a further aid in the diagnosis of cholesteatoma is the Roentgenogram. This is of value only where a tumor mass of considerable size is present. The X-ray will then show an area of decreased density surrounded by a sharply defined, limiting bony wall situated within a sclerotic mastoid process.

The primary type of pseudocholesteatoma presents difficulty in diagnosis simply because the patient has no symptoms referable to his ear. He does not go to a physician until an otorrhea appears or symptoms of intracranial involvement make their appearance and then, as I have already said, the situation is grave. Fortunately, this type of pseudocholesteatoma is not as common as the secondary type. It can be identified before suppuration appears, in the following manner.

Otoscopic examination reveals an intact pars tensa. The umbo, the long process and the short process are distinctly seen. Above the short process, however, in the area normally occupied by Shrapnell's membrane, a marginal defect is seen in the drum. This is commonly described as an attic perforation and through it cholesteatomatous masses may be obtained with a probe. Here, too, the microscope, the test tube and the X-ray will aid in diagnosis.

If a cholesteatomatous tumor mass comes in contact with water, during bathing, for example, or when the ear is douched, a discharge from the ear occurs through the attic perforation. The reason for this is that the cholesteatomatous mass is extremely hydroscopic and

swells tremendously when brought into contact with water. If the tumor mass has already eroded beyond the confines of the inner table of the mastoid process or middle ear, the rapid expansion which follows wetting may result in a fulminating intracranial lesion, such as leptomeningitis, sinus thrombosis or purulent labyrinthitis.

This brings up an extremely important practical point. No patient with a chronic otorrhea of long duration should go swimming unless he has been definitely assured that his chronically discharging ear is not of cholesteatomatous origin. Because of the extremely hydroscopic quality of the cholesteatoma mass, the immersion of the ears in water, with consequent saturation of the tumor, causes the latter to swell and thereby encourages the development of the intracranial lesions to which I have already alluded.

Sometimes, in cases of cholesteatoma, there is a remission of the otorrhea. As the discharge abates, secretions dry within the confines of the external auditory canal and become dirtied and discolored by the dust and soot in our atmosphere. When the patient is seen by a physician at this phase, it may be erroneously assumed that the discolored concretions in the depth of the ear canal are cerumen. An attempt to remove this supposed cerumen by washing with an aqueous solution may also result in rapid swelling of the tumor mass with possibly disastrous consequences. Removal of cerumen should never be attempted by the use of aqueous solutions in patients whose history even suggests the possible presence of a cholesteatoma. In such cases a solution of alcohol may be used, or enough of the accumulation should be removed with instruments to permit a complete view of the drum so that it may be seen whether the latter is open or intact.

Therapy: All cases of cholesteatoma must have the element of pressure removed by the establishment of adequate drainage for the desquamated epidermis since it is this factor primarily which is responsible for the growth of the tumor and which stimulates the resorption foci to make way for its spread into the endocranium through the dense, compact bone. Not infrequently Nature relieves the abnormal pressure by causing an erosion of the posterior bony canal wall, in this way establishing a wide channel of egress for the cholesteatomatous masses into the external auditory meatus. In most instances, however, the growth of the tumor mass is toward some vital structure within or surrounding the temporal bone. Its extension in this direction leads towards the labyrinth, the pia-arachnoid or the lateral sinus. Once these structures have been exposed and brought into contact with the opening in the tympanic membrane, any infection within the cholesteatomatous tumor will immediately

spread to them and result in a complication which is more often than not lethal in character. The establishment of adequate egress for the desquamated epidermis which constitutes the tumor mass, whether by Nature, as before stated, or by surgery, will definitely avert fatal sequellae in the majority of cases.

Once a diagnosis of pseudocholesteatoma has been established, whether the lesion is of the primary or the secondary type, the patient must be cautioned as to its potential danger to life. When the tumor is discovered early in its development and the Roentgenogram does not reveal an extensive growth, the case may be treated with the idea of removing the desquamated epidermis and thereby preventing pressure from its accumulation.

Various means have been advocated for this. The one most commonly employed is that of syringing the recessus antri and the antrum with a solution which will dissolve the desquamated epidermis. Either absolute alcohol or carbon tetrachloride may be employed. Another method for the treatment of such cases is a modified ossiculectomy, whereby the remnants of the ossicles are removed and the outer attic wall broken away, thus affording free communication between the recessus antri and the external auditory canal. Whatever is done, the patient must be impressed with the fact that if he permits the lesion in his ear to come in contact with water or any aqueous solution, a sudden increase in the size of the tumor mass may result and a very rapid growth occur with dangerous after-effects.

The majority of cases require more extensive surgery to eradicate the lesion. The operation of choice is a radical mastoidectomy. This procedure does not merely enable the surgeon to remove the tumor mass which is causing the pressure that, in turn, brings about the destruction of the surrounding bone by resorption foci. It also permits him to remove the barrier between the cholesteatomatous cavity in the mastoid process and the external auditory canal. The removal of this posterior bony canal wall, coupled with the removal of the tumor mass everywhere in the mastoid process and middle ear, allows the entire bony space occupied by the cholesteatoma to come into wide contact with the outer ear. This is all that is necessary for the cure of the cholesteatoma in the average case.

The matrix, which we formerly removed so carefully, is now utilized in healing and may be left *in situ* to line the large bony cavity created by the radical mastoidectomy. As you know, this matrix is composed of epidermis which differs in no way from the epidermis of the rest of the body. The use of the matrix in this way has

materially shortened the after-treatment. The purpose of the operation has been accomplished, for the enormous opening that has been made affords adequate drainage for the desquamated horny epidermis.

In cases wherein the cholesteatoma has already invaded one of the vital structures in or about the temporal bone but has not as yet produced any symptoms referable to the involvement of these structures, extra care must be exercised during the performance of the radical operation to remove the tumor mass in its entirety. Every vestige of the cholesteatoma and its matrix must be ferreted out and fastidiously removed, since to leave any remnant of matrix in an area where its desquamated epidermis will not have easy access to the large opening made will result in the formation of another cholesteatomatous tumor in the region in question.

Where the extensive growth of the cholesteatoma has already resulted in an intracranial complication or in an acute purulent labyrinthitis, the therapy indicated is relief of the complication, rather than attention to the tumor itself. For instance, in the presence of a sinus thrombosis it would not suffice simply to remove the tumor mass. Neither would an acute purulent labyrinthitis be cured by surgery confined to the cholesteatoma.

The hope of preventative otology, with respect to cholesteatoma, lies in two factors. There must be early recognition of the tumor as the basis of a given chronic otorrhea for one thing. For another, therapeutic measures must be instituted promptly with a view to affording free egress to the detritus from the tumor. Only in this way can we forestall and prevent the inevitable consequences of an unrelieved cholesteatoma; namely, an intracranial lesion which, because of the infection it carries to the vital structures of the cranium, usually terminates fatally.

51 West 73rd Street.

PRIMARY JUGULAR BULB THROMBOSIS, WITH METASTASIS. OPERATION; RECOVERY.*†

DR. SOL. MALIS, Los Angeles.

Only when methods will be perfected for early diagnosis and prompt surgical intervention, following complete and accurate laboratory aids and constant bedside observation, may we expect better results and more recoveries in sinus thrombosis.

The first account of primary jugular thrombosis with its diagnostic points is ascribed to James McKernon, who, in 1904, defined this entity. Although considerable work on primary bulb thrombosis has been done following McKernon's reports, there is yet no positive way of arriving at a diagnosis of primary bulb thrombosis. It is, however, considered that cases of acute purulent otitis media occurring in children, presenting symptoms of sepsis, and in addition a positive blood culture, should arouse suspicion of thrombosis of the bulb. A case of primary bulb thrombosis in an adult was reported by Wieder and Bates.

Recent statistics from several representative hospitals also reveal that primary jugular bulb thrombosis is still to be considered rare both in its occurrence, diagnosis and recovery. According to Maybaum and Goldman, in a very active service of the Mt. Sinai Hospital, New York, in a period of seven years, only nine cases of primary bulb thrombosis have been reported. In a period of over eight years at the Manhattan Eye and Ear Infirmary, not a single case has been reported. At the Los Angeles General Hospital, from July 1, 1925, to July 1, 1931, in a period of six years, with over 6,200 operations in the eye, nose and throat service, not a case of primary bulb thrombosis has been recorded.

It is because of its comparative rarity and first recovery following operation, at the Los Angeles General Hospital, since 1925, that the case is herein presented. It seems to indicate that an early diagnosis with prompt surgical intervention effected a favorable outcome of the serious illness in this case.

R. L., male, white, age 10 years, was admitted to Dr. Detling's service of the Los Angeles General Hospital on March 22, 1932,

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†From the Ear, Nose and Throat Department of the Los Angeles General Hospital.

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complaining of pain in right ear of one week duration, with profuse otorrhea of same duration. Temperature, 101.4°; pulse, 108. He had severe diffuse headache and vomiting the day before admission. Prior to his admission he was seen in the ear clinic several times with his earache growing progressively worse.

Past History: Always healthy except for pneumonia at birth. No past history of ear trouble. Family history negative.

Physical Examination on Admission: Fairly well developed and nourished white male, age 10 years, was lying in bed not complaining, and apparently in no acute pain, but appeared quite lethargic, and did not respond to questions readily.

Head and Scalp: Negative. *Eyes:* Movements good in all directions. Pupils equal, regular and reacted well to light and accommodation. *Ears:* Thick purulent discharge from right ear. Left ear negative. Mastoid area on right only slightly tender on deep pressure. *Nose:* Negative. *Mouth:* Teeth in fair condition, tonsils enlarged, cryptic and infected. *Neck:* No pulsations or swellings. *Chest and Abdomen:* Negative. *Extremities:* Negative. *Reflexes:* Both patellar and biceps somewhat increased. Babinski and Kernig sign negative. *Blood Counts:* R. B. C., 5,420,000; hemoglobin, 85 per cent; W. B. C., 15,100; polymorphs., 87 per cent.

In the evening patient's fever rose to 105.6° (R.); pulse, 142. Next day patient was seen by the neurological department, and a tentative diagnosis of "slight meningismus and possible early scarlet fever" was made. He was again seen in the clinic that day ,and because of his better appearance and no neck rigidity no operation was advised.

On March 24, 5:40 p. m., patient took a change for the worse. His fever rose to 106.2° (R.); pulse, 146. His left elbow was now painful to palpation and passive movement. He cried constantly for water and was given large quantities of it. At 7 p. m. I was called in to see the patient. At that time I found the patient quite toxic and drowsy; responded to questions with effort. He was stuperous. There was no Kernig sign and no neck rigidity. Left elbow slightly swollen and tender to touch and movement. There was a tender cord-like swelling, size of a large olive, extending from the right mastoid tip downward for about one and one-half inches under the sternomastoid muscle within the posterior triangle. There was no fluctuation, no postauricular edema or mastoid tenderness. There was a purulosanguineous pulsating otorrhea from his right ear with drum landmarks distorted. Eye grounds by Dr. Courville: "Right disc normal in size, but somewhat pale, cup filling in; tem-

poral side somewhat hazy. Veins engorged and show an elevation as they go over margin of disc. Left side normal in size but margins indistinct and fuzzy. Veins engorged."

Laboratory Findings of Previous Day: R. B. C., 5,420,000; hemoglobin, 85 per cent; W. B. C., 15,100; polymorphs., 87 per cent. Smear from discharge of right ear showed streptococci and diphtheroid bacilli. Urinalysis, negative. Wassermann test, negative. X-ray of mastoids revealed "a bilateral chronic mastoiditis, as evidenced by sclerosis of both mastoid regions, particularly involving the left side." Blood cultures and Quackenstadt test had both been done at the time I saw the patient.

In the presence of patient's septic temperature, painful and progressive otorrhea, mass in the lower mastoid region, suspicious eye-ground findings, history of headaches and vomiting, and possible hematogenous infection of left elbow, I felt it was more than a simple mastoiditis, probably a lateral sinus involvement, and so I advised immediate surgery. There was nothing else to account for patient's clinical course.

Operation Under Ether Anesthesia at 9:20 p. m.: Right simple mastoidectomy. Mastoid was found small, narrow and sclerotic throughout. No frank pus or breaking down of cells was noted anywhere. Bearing in mind the arthritic infection, the inner table of the sigmoid sinus was removed, the outer sinus wall appeared smooth and blue, no discoloration or roughness was noted, no pulsation or nodular masses felt by compressing sinus wall with finger (although I do not believe that the condition of the outside wall offers any positive evidence of what lies within). After exposing the sinus wall, from the tip of the mastoid to its knee, for about three-fourths inch, we twice attempted to aspirate the sinus, but without success. The sinus wall was then incised with a Graefe knife, the lips of the sinus wall taken apart, exposing an obturating thrombus within. The sinus wall was thick and inflamed only in the lower end of the sigmoid portion. After removing the clot, which was red and soft, from the lower end of the sigmoid, blood began to flow freely from the torcular end. The removed clot was then cultured. Before the bleeding from the torcular end was checked, the suction between the everted lips of the open sinus was introduced and all visible adherent clots sucked out, allowing then a few moments of hemorrhage to wash out the infected material. Three cotton-tailed plugs were then placed between the outer sinus wall and the overlying bone beyond the thickened sinus wall. Attempts were then made with tissue forceps to remove the lower clot, which was white and well

organized within the bulb, but with no bleeding forthcoming from the bulb. At this time the anesthetist reported that "the condition of the patient was critical, that his pulse was over 220, and his breathing very poor." I then placed one cotton-tailed plug below and changed the field of operation for the neck, leaving the entire post-auricular wound open except for filling it with vaseline.

On exposing the internal jugular vein for about three inches through a long incision, it appeared grayish-blue, pulsating and rather wide, about one-half-inch in width in its entire extent. Ligation of the internal jugular vein was then carried out with double No. 1 plain catgut; having ligated internal jugular above the inferior thyroid, the middle and inferior thyroid veins, the facial vein, and the internal jugular vein above the common facial. Incision and resection of the jugular was suggested at time of operation. This I did not do, for the following reasons: *1.* Fear of wound infection; *2.* avoidance of further shock to patient; *3.* saving of time.

The neck wound was then sutured. The muscles taken in with a continuous No. 1 plain catgut, while the skin with Michel clamps. No drain was used. External dressing was applied, taking in mastoid and neck wounds in one. Having ligated the internal jugular vein, I felt I did all I could for the patient, at that time.

Postoperative Course: March 25, fever went down to 105° (R.); pulse, 140. Blood culture taken from patient's right arm.

March 26, temperature fluctuated from 100-104°. Culture taken from sinus at time of operation was reported, "Streptococcus Hemolyticus, Beta." A transfusion of 350 c.c. of whole blood from patient's father was given by direct method.

March 27, fever, 104. Pulse, 128. Leukocytosis, 22,000. Polys., 86 per cent. Patient's intellect clear, felt very much better with exception of complaining of pain in left elbow joint.

March 28th, temperature fluctuated from 99-103°. Leukocytosis, 23,000.

March 30, sixth postoperative day. Temperature, 102°. Leukocytosis, 23,000. Polys., 86 per cent. All cotton-tipped plugs from mastoid wound were removed. No bleeding was noticed. The Michel clamps were removed the same day.

April 1, two days later, temperature, 100-103°. Leukocytosis, 16,000. Polys., 89 per cent. On dressing I noticed his neck wound entirely open, the edges of the wound gaping for about two inches, and the wound filled with a profuse bloody purulent discharge. I concluded that the unresected jugular vein must have sloughed off, and a drain in the neck wound was placed between the muscle

sheaths. This was repeated for several days, coapting the edges of the neck wound with adhesive. Dressings were then changed every third day.

April 5, tenth postoperative day, the blood culture taken a day after the operation from patient's right arm was reported negative.

During his postoperative course patient was carefully watched for pain, chills, rise in temperature, headaches and vomiting. He was examined daily for nystagmus, neck rigidity, eye grounds, ocular movements and aphasia.

April 9, temperature, 100°. Leukocytosis, 10,000; Polys., 74 per cent. Patient's left elbow was placed in a plaster cast.

For almost a month after the operation patient continued to have a leukocytosis of 10,000-12,000, but with a very high polymorphonuclear count, as shown in the diagram. This I ascribed to the arthritic infection.

Patient's Diagram: Diagrams for comparison (next page).

It is interesting to note that at no time did the patient have a chill, in spite of his positive blood culture and remittent fever during 18 days. As a rule these patients do not have a distinct chill; they may, however, have chilly sensations.

In spite of patient's daily irregular rise in temperature, and the peculiar filament nonfilament in his daily white blood counts, as shown in the diagram, clinically he has been progressively getting better. The neck wound is now completely healed with little scar visible, and the postauricular wound has closed up nicely. His right ear shows a completely resolved drum of good luster, and he hears a low spoken voice (in the same ear) at a distance of twelve inches.

April 30, 39 days after admission to the hospital, patient was discharged from the eye, nose and throat service completely recovered, except for semiweekly visits to the hospital for massage and baking of his left elbow.

Summary: The case presented here is one of primary jugular bulb thrombosis without mastoid involvement. In all of these cases of primary bulb thrombosis, regardless of the mode of production, a surgical mastoiditis rarely precedes the formation of the thrombus. That the bulb was first attacked, in this case, and not the sinus, is substantiated by the color and character of the thrombus within the vein, and by the normal appearance of the sinus and bulb outside.

One may question what became of thrombus within the bulb, since the red clot removed at time of the operation and cultured revealed a streptococemia; why were not the other sinuses involved by retrograde thrombosis? According to the observation of Libman,

while one end of the thrombus may undergo suppurative changes, which in this case was most likely removed at time of operation, the rest in the bulb may remain sterile; and whatever infected clot may remain in the bulb is taken care of by the bactericidal action of the blood and drainage.

Comments: This case reveals:

1. That the great problem in sinus thrombosis is not so much the etiology, or the operative technique, but the early recognition of the infection of the sinus, as the danger increases with each day. (It is also true that the ultimate outcome of a case depends in no small measure upon the surgical judgment and technique of the physician in charge.)

2. That a metastatic phenomenon with sepsis may act both as an aid in the diagnosis, and at the same time may mislead one, for the patient may have a hematogenous septic arthritis from the middle ear infection which would account for his septic temperature, chills, positive blood culture, without sinus involvement. Although in this case the tender mass in the posterior triangle, and eye ground findings were of considerable aid in establishing a diagnosis.

3. That the time element and patient's condition at time of the operation are important factors to guide us, what and how much to do. Probably the outcome of patient's condition would have been entirely different if I had continued with further exploration of the bulb instead of leaving it as I did. In the nine cases of primary bulb thrombosis, reported by Maybaum and Goldman, not once did they resort to extensive exploration of the bulb. According to the consensus of opinion, extensive bulb operation, like the Grunert, Voss, Piffle and their modifications, is unnecessary in the majority of cases.

4. That arthritic metastases following otogenous general sepsis are of no immediate fear, and are least dangerous from a prognostic point of view. McDaniel reported a case of jugular bulb thrombosis complicated by several arthritic purulent infections with complete recovery following incision and drainage of over 500 c.c. of pus from the right thigh.

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1242 Roosevelt Building.

A NEW TONSIL KNIFE AND ENUCLEATOR.

DR. S. P. SCHECHTER, New York.

Description of Instrument: Instrument totals about 8 inches in length and consists of: *1.* A serrated spoon with 7 teeth at the distal end. The spoon is bent at an angle of 45° in relation to the shank of the instrument. *2.* On the opposite extremity is a blunt end concave, double-edged knife at right angles to the shank. The knife is the same width where it meets the shank (4 m.m.) and gradually widens to 5 m.m. at the blunt end.

TECHNIQUE OF OPERATION.

1. A tongue depressor is used in order that both lobes of the tonsil may be grasped with the forceps in one bite. Then the tonsil is rotated medially and anteriorly. Now the tongue depressor is removed. The convex part of the tonsil forceps is used to depress the tongue so that the operator may have a clear view of the tonsil and the surrounding structures.

2. The blunt end of the knife is inserted at the point where the anterior pillar meets the tongue. The knife is tilted so that the blunt edge is pointed downward. With a little pressure the knife slips beneath the anterior pillar so that the concavity of the knife con-

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forms with the convexity of the tonsil. The knife is then swept in a rotary movement upward and inward following the contour of the tonsil (the end of the shank of the instrument acting as a pivot) until the knife emerges at the medial attachment of the anterior pillar of the tonsil.

3. With the serrated end of the spoon the anterior pillar is gently peeled back as far as possible.

4. The tonsil is rotated laterally in order to expose the posterior pillar.

5. The knife is then placed at the lower end of the posterior pillar attachment between the pillar and tonsil, so that the convexity of the tonsil fits into the concavity of the knife. The knife is directed upward and outward to separate the posterior pillar attachment.

6. Traction is made on the tonsil.

7. The spoon is now inserted in the supratonsillar fossa, so that the hollow of the spoon hugs the superior pole of the tonsil. Firm pressure is exerted on the tonsil downward, peeling the tonsil out of its bed until it is attached only by its lower portion.

8. Now the tonsil is readily removed by a snare. The same procedure applies to the opposite tonsil.

ADVANTAGES.

1. Use of one instrument for the entire dissection of both tonsils.

2. Rapidity of operation; ease of separation due to knife fitting the contour of the tonsil, requiring one sweep of the knife to separate the anterior pillar, and another for the posterior pillar. The concavity of the knife fits any size tonsil.

3. Serrated distal end of spoon facilitates the peeling back of the anterior pillar in cases of adhesions.

4. The tonsil is enucleated intact without injury to the capsule.

5. With practice, injury to the pillars does not occur.

1325 Grand Concourse.

THE NEW YORK ACADEMY OF MEDICINE.

SECTION OF OTO-LARYNGOLOGY.

(Continued from page 80.)

The Technique of Some of the Uses of Surgical Diathermy in Rhino-Laryngology. Dr. W. Wallace Morrison.

(To be published in a subsequent issue of THE LARYNGOSCOPE.*)*

DISCUSSION.

DR. LEE M. HURD: I think Dr. Morrison's pictures speak for themselves. I wish, though, that he would bring out that electrocoagulation is not to be used for removal of tonsils except where surgery is strictly contraindicated.

DR. H. H. FORBES: The subject is one on which there has been much controversy in regard to the two methods of treatment; but when the subject is brought out by a man who has made as careful a study of it as has Dr. Morrison, every member of the Section should feel that such work is a step in the right direction; it is not presented by a physiotherapist but by a member of our own Section, who I know is doing good work. Sooner or later the Section will have to take some definite stand in the use of surgical diathermy in removal of tonsils, and when it is done I feel that we ought to congratulate ourselves.

DR. W. BRANOWER: What should be emphasized is that there is an element of danger in it. The technique must be thoroughly understood, the indications for its employment carefully studied and the application carefully made. It must be done by men who are familiar with all the surgery and anatomy of the nose and throat, and who have had considerable experience in this direction. I believe that with increasing experience I am learning its value; but it must be emphasized that we must know something about the application of the current . . .when we are getting the results that we want, and when we are going beyond that stage to disintegration and secondary hemorrhage that may be very prolonged.

DR. L. D. ALEXANDER: I am much interested in this subject, and it has always been my hope that electrocoagulation would relieve the minds of singers from fear. I have changed from one to another of the various machines, and now have a fairly satisfactory one, but am, frankly, still disappointed in my results—the sum total of which is just the same as in tonsillectomy.

I have done a little at a time, and much at a time, and agree with Dr. Forbes that it is only for selected cases. I have tried unipolar and bipolar needles which have been brought forward for a kind of cure-all, but I do not feel that I am getting along as well as I should.

I do hope that the Section will again report on the subject, and that I may yet become an optimist instead of a pessimist.

DR. GLUSHAK: This question of coagulation diathermy of tonsils is so much debated pro and contra that to those protagonists I would venture a suggestion: Instead of telling us how many cases they have done, it would convince us more firmly of their method by demonstrating the results of half-a-dozen cases satisfactorily completed here in the Academy.

DR. MORRISON (closing): My presentation was purposely confined to considerations of technique only, as I feel that we must first learn good technique, then study indications and contra-indications for the use of the methods presented. I do feel, however, that electrosurgery in the nose and throat is for use only in selected cases, and that it should be performed by well trained oto-laryngologists only if we are to secure the best results possible. Certain procedures, such as the electrocoagulation of the faucial tonsils, is being offered

by some as the method of election for their removal; we are strongly against any such idea. Certain other of the procedures described are of great value, and may easily supplant methods now in use; other procedures are of limited use and advantage. The final evaluation of the method can only come with the passage of time.

DR. LEDERMAN: How strong a current do you use?

DR. MORRISON: For all the common procedures a quite delicate current is used; we ordinarily pay little attention to meter readings, or questions of amperage. We have studied the action of the current with the machine we use at all possible settings of the controls, making use of the electrodes, such as we employ in the nose and throat, upon a piece of raw meat. This is the way to learn how to apply the current and what it will do; thus certain settings for each machine are found which can be duplicated whenever the same procedure is to be carried out.

Intranasal Opening of the Maxillary Antrum by Electrocutting and Coagulation. Dr. Louis Hubert.

In many articles on electrosurgery attention is called to the danger of bone necrosis if during the operative procedure the active electrode happens to come in contact with periosteum. I was aware of this risk when I started this work, a little over a year ago, in Dr. Francis White's Clinic of the Manhattan Eye, Ear and Throat Hospital. I proceeded with great caution and soon found out that bone necrosis of the maxillary antrum can be avoided by a proper technique and a proper selection of patients.

Technique: We use at the Manhattan Eye, Ear and Throat Hospital a low voltage high frequency machine. It is probable that a high voltage machine is not suitable for electrosurgery on the antrum, because the higher the voltage the easier sparks will occur at the cutting electrode, and such sparks tend to carbonize the margins of the wound and may thus cause necrosis of bone. Of utmost importance in this work is the proper setting of the machine. For electrosurgery on the antrum the controls of the apparatus are so set that a current of 3000 m.a. is obtained if the two binding posts are short-circuited by a piece of wire. With such a setting a large indifferent electrode of about 60-70 square inches is employed in children, who are operated upon under general anesthesia, or a spring-jawed arm electrode is utilized in adults in whom local anesthesia is always used. The local anesthesia must be as thorough as if a regular intranasal antrum operation is to be performed. If the anesthesia is not complete, the patients become nervous on account of a peculiar reflex pain in the teeth and resist further manipulation.

The proper handling of the active electrode, which is an insulated trocar, is of great importance. This electrode, which is connected to one of the binding posts of the machine, is placed underneath the inferior turbinate at about the point where a trocar for washing out the antrum is usually placed. With the machine properly set and operated with a foot switch, the electrified and insulated trocar may within a few seconds cut its way through into the antrum, if the nasoantral wall is very thin, or with the current still on, it is pushed through with a moderate amount of force, if the wall is thicker. As the trocar enters the antrum the insulating rubber is partly shoved back during the procedure and a larger area is thus exposed for coagulating. The current is then interrupted by the foot switch and the trocar removed. It is surprising to find an opening in the antral wall from four to six times the diameter of the trocar used. In thick walls the opening may not be large enough and the trocar is then reintroduced through the same opening and the tissues around the opening are coagulated again. Care must be taken not to make a new opening in the nasoantral wall, as necrosis of bone between the two openings may follow. Care must also be taken that the trocar does not touch the interior walls of the antrum, as sloughing and severe reactions may follow. Cautious handling of the trocar is therefore essential for the success of this procedure.

Selection of Patients: The first patients who were submitted to the above procedure had been already operated on the antra by the usual methods, but the antral openings were practically closed when re-examined some time after

the primary operation. When the electrified trocar was placed in the space where the original opening was made, it cut through the scar tissue and granulations and a large opening with no tendency to close remained. This method was then tried on patients with chronic antral disease and who had not been operated on before. There was no appreciable reaction in cases with moderately thin antral walls. In patients with very thick nasoantral walls a great deal of force had to be used in order to break through the walls. A moderate reaction usually followed this procedure. During the influenza epidemic of this year I used this method in two cases of acute antral disease and a marked reaction followed in both cases. It should therefore never be used in acute conditions of the antrum and with great care in chronic conditions with very thick walls. It is an ideal method in those patients whose antra had been operated upon before, but with the openings more or less closed, and in chronic cases with thin nasoantral walls.

With due precautions and selection of patients the results of the procedure described in this paper are very good. The openings made in the nasoantral walls are large and show little tendency to close even without any after-treatment. For several weeks bare bone is detectable around the openings. Although no necrosis of bone can be made out, a slight degree of it, just enough to keep the openings patent, probably occurs. After some time the bare bone becomes covered with mucus membrane.

What are the advantages of this operation? If carefully performed, it is very simple; it takes only a few seconds to do, and surpasses in its results the more elaborate operations usually performed for the same purpose. There is little or no bleeding during the operation and no postoperative hemorrhage. Adhesions that are frequently formed between the inferior turbinate and the septum after the usual operations, are conspicuous by their absence. Very little after-treatment is necessary. This operation is therefore especially of service in children, in whom an operation on the antrum is indicated. It is done under general anesthesia.

Disadvantages of the Operation: If the various precautions indicated in this paper are carefully observed there are practically no disadvantages. However, this operation cannot be used indiscriminately and is likely to do a great deal of damage, if not properly performed.

In conclusion, I wish to express my belief that the operation described represents progress in the intranasal surgery of the antrum.

DISCUSSION.

DR. FRANCIS W. WHITE: I have been observing Dr. Hubert's work rather closely ever since he started to use this method of opening the antra. I wish to call attention particularly to a few points that he has already brought out. The first is the proper setting of the machine. This should not be tampered with. Second, the technique in handling the thin wall as compared to the thick wall. Third, the formation of a cuff by the insulating rubber as the trocar passes through the antral wall. Fourth, that when an opening into the antral wall has been made, the trocar should be, at any future time, introduced through the same opening. If another opening is made in proximity to the original opening, the intervening bone may undergo necrosis. Dexterity in introducing the trocar so it does not impinge upon any part of the internal wall of the antrum, as sloughing may occur, attended by severe reaction. During respiratory epidemics, attended with acute antritis, this method of opening the antra is contra-indicated.

THE NEW YORK ACADEMY OF MEDICINE.

SECTION OF OTOLARYNGOLOGY

April 20, 1932.

DR. JOHN A. HARTWELL: There is a significance in the meeting this evening which is very gratifying. As the Chariman said, the Section has departed from the usual custom and is here for the double purpose of expressing love and admiration for a man and, at the same time, of showing what that man has done. You of this audience knew Dr. Mackenty intimately. You worked with him; you learned from him; you saw his skill develop; you had opportunity to see the high ideals he brought into his work; you were associated with a master and you have seen fit to gather here this evening and dedicate this meeting to the memory of a man whom you loved.

Those who will speak of his work can say far better than I what that work means. They will tell you of the development that Dr. Mackenty brought into the particular field that he honored. It is my privilege to speak briefly of the man: one who set his ideals very high and who lived up to those ideals; one who by his association with you and with this Academy has left a distinct imprint.

There is something rather touching in the spontaneity of this meeting. We have not waited to express our feelings but desire to express them sincerely and with deep feeling while the memories are still living.

I did not have the opportunity of knowing Dr. Mackenty as intimately as I could have desired, but the few times I came in contact with him I was deeply impressed by the standards of the man; his kindness; his sincerity. I was, of course, also impressed by his skill and by what that skill showed in the way of training. One of his close associates has written a letter to me, concerning a side of Dr. Mackenty's nature and character, which I ask your permission to read.

"Dr. Mackenty was an artist in life, a poet by nature. In his personal letters he wrote a poetic prose like that of Tagore and Gibram,—giving expression to the noblest of sentiments and breathing hope, kindness and good will. In a letter written to me in 1917, from Long Lake where he was resting, he spoke in one place of the 'waiting stillness of the woods,' and in another said 'all things here are a mute rebuke to effort because without it they fulfill their destiny.'

"The one thing that angered him in a physician was insincerity in dealing with his patients. He was modest in diagnosis and judgment, but definite. He welcomed the opinions of others. He was a master surgeon. Having been a long time in general surgery, doing his work in that field, he then took up his specialty. He was meticulous in his aftercare of patients. It was due to this that he almost completely excluded bronchopneumonia in laryngectomy. He once told me that he required two to three hours a day of aftercare for a number of days for every patient upon whom he performed this operation."

A man who has these characteristics and such ability is bound to leave his stamp. You will hear (you already know) from his confreres of the actual work he has accomplished, of the great benefit he has been not only to the profession but to the community at large; but there is one side of his development that has a very general bearing, and it seems to me to be worthy of emphasis at the present time.

Dr. Mackenty was born in Canada and received his formal education there. He came to New York in 1892 bearing the diploma of McGill University. In the United States, of which he promptly became a citizen, he devoted

himself for a full decade to general surgery. He became an excellent surgeon, viewing surgery from a broad standpoint and it was only his realization that there were certain things in the field of laryngology that required his full efforts and full time that gradually led him to that particular specialty. His student days had finished but his actual days of study continued through the remaining forty years of his life. When he decided that, as a specialist, he could be of more service than as a general surgeon, he again took up formal study and for two or three years devoted his time here and abroad to the study of laryngology.

To his career as a laryngologist, he brought the mature judgment of a broadly educated man, a man who approached the problems of that particular field with the judgment, the skill and knowledge of general surgical principles. What Dr. Mackenty did in this way is an example of great value at the present time. It is a fairly complete answer to the problem of the control of exploitation of the community by so-called specialists who have not spent the time and effort to gain the general experience and training which justify their attempt to take up a specialized field. It seems to me that this example of Dr. Mackenty should be carefully studied by every one who contemplates entering into a specialty. It is a valuable lesson. This Academy is studying with a great deal of thought and a great deal of effort, with the aid of the best minds it can muster, a formulation of the qualifications to be required of those who desire to be known as experts in some particular branch of medicine. Those who are conducting this study will do well to carefully consider the training Dr. Mackenty found to be valuable.

We are here to pay our tribute to a man who has left his mark upon this community and far beyond it; who by industry, ability, integrity, strength of character, kindliness, arrived at a position of mastery among us. It is fitting and appropriate that, under the auspices of the Section with which he was so closely identified, this tribute to his memory be paid.

The Academy extends to the family and intimate friends of Dr. Mackenty its deep sympathy in their having lost the close association of the past. But there is recognition that, in a broader sense, those associations are not lost. You who work in his chosen field are his debtors. Those who suffer from the conditions he so ably treated will be the more skillfully treated by you because of the work he did. With this expression of sympathy on the part of the Academy, we also acknowledge our great indebtedness to Dr. Mackenty and bear witness to the benefit which is ours, resting in the full assurance that the end of this benefit is not yet.

A History of Thyrotomy and Laryngectomy. Dr. D. Bryson Delavan.

(Published in full in this issue.)

Outstanding Points in Laryngectomy as Developed by Mackenty and Some of the Other Ideas Relating to This Operation. Dr. Fielding O. Lewis.

(Published in full in this issue.)

Atresia of the Pharynx and Other Plastic Operations Developed by Dr. Mackenty. Dr. E. Ross Faulkner.

(Published in full in this issue.)

MR. JOSEPH L. BUTTENWEISER: "There is no pleasure without its accompanying pain," and I take it that we may reverse this statement and say that there is no pain without its accompanying pleasure.

Out of the gloom of physical and mental pain occasioned by an operation such as I have had to undergo, there comes, even in the sorrow of Dr. Mackenty's death, the pleasure of the friendship, which I shall ever cherish, of that great surgeon and noble soul whose memory you gentlemen do well to honor.

I am supposed to speak about my personal experience with his artificial larynx. This demonstration of its use is far more eloquent than any words of mine, of its incalculable value, for without it I would practically be cut

off from communication with the outside world, while with it I am able, however imperfectly, to converse with my fellow men, to conduct business, and to speak over the telephone even from such distant points as Florida and Colorado Springs. I need not tell an audience like this what that means to one to whom speech is such an indispensable asset.

You will, I am sure, pardon me if I do what I cannot refrain from doing, and that is to say a word about the man in whose memory we have met tonight, and who was an ornament to your profession not only because of his outstanding skill as a surgeon and his almost uncanny power of diagnosis, but because he never prostituted his profession to personal gain. His first and only thought was of his patient and the last and least consideration with him was the monetary return.

Were your patience unbounded, were the time allotted to me unlimited and were my wealth of language inexhaustible, I still could not do justice to the work and worth of Dr. Mackenty.

His life work proves that "Peace hath her victories no less renowned than war." The world pays willing homage to the general who fights and wins a great battle in which untold thousands are sent to their death and myriads of others are doomed to what is far worse, a living death, but hardly pauses to note the passing of one who fought so unceasingly, so heroically and so successfully, not to destroy, but to save and restore life, with beneficent results which no human eye can measure, no finite mind can reckon, but which can be measured only by the unseen eye of Him in whose divine service Mackenty labored so devotedly and so unselfishly.

When a man dies, people ask "How much did he leave behind?" but the angels ask "What good deeds has he sent before?" To the former I would say, Dr. Mackenty left behind a priceless wealth of blessings and bequeathed to his profession the inalienable legacy of an example worthy alike of admiration and imitation, and he sent before an inspiring record of faithful ministration in the Temple of Humanity, where he translated his prayers into deeds of loving and self-sacrificing service to his fellow-men. And so I am very sure that, when the Recording Angel scanned that record, he dipped his pen afresh into the sunlight and inscribed in the Book of Immortal Life in letters of gold the name of JOHN EDMUND MACKENTY.

Diagnosis of Early Cancer of the Larynx. Dr. C. G. Coakley.

(Published in full in this issue.)

The Cancer Problem as Related to Laryngology. Dr. H. S. Martland.

(Published in full in this issue.)

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

SECTION ON OTOLARYNGOLOGY

Meeting of Oct. 14, 1932.

Dr. H. J. Rothschild, President, presiding.

DR. H. I. LILLIE gave a talk on "Certain Aspects of the Nonsurgical Treatment of Nose, Throat and Ear Conditions." Dr. Lillie said he was particularly interested in two phases of nonsurgical care of ear, nose and throat patients, i.e., in the nonallergic vasomotor conditions, and in those affections of the pharynx usually described as granular pharyngitis. He discussed briefly the embryology of tonsillar tissue, outlined five theories as to its physiology, and some forms of treatment of granular pharyngitis. He also discussed various types of chronic otitis media and their treatment.

DISCUSSION

DR. GEORGE C. DITTMAN said, in regard to vasomotor rhinitis, that several years ago an acquaintance of his came to him from Chicago and stated that his doctor in Chicago had been using trichloracetic acid in his case and he wanted Dr. Dittman to use it. Dr. Dittman had the patient get directions from the Chicago doctor, and upon receipt of them Dr. Dittman applied the acid according to directions. The man got a reaction all right, but stated that by the next day he would feel fine. In the Vienna clinic they used silver nitrate; the patients would go away drooling wonderfully and come back the next day feeling very fine. However, in America Dr. Dittman said he would caution most of the men against using it because one is liable to lose his patients. The patient expects to be relieved by treatment, but with the application of the silver nitrate the discharge becomes more profuse and he may think the doctor has made it worse. However, within another twenty-four hours they will get to feeling very much better. Dr. Dittman was of the opinion that if one is going to use silver nitrate in private practice, it would be well to explain to the patient beforehand what is likely to be expected from the application.

DR. H. W. GRANT asked Dr. Lillie what the dosage of iodine is for an adult.

DR. J. H. GAMMELL asked about the use of siomine.

DR. F. J. PRATT said they had been working along a little different line with these patients, that is, with the body chemistry. But it is a rather complicated subject. The principle is that if you have an acidosis you do not have a vasomotor rhinitis. They had used HCl in some cases, but in so doing they have to replace the calcium in some way as it is driven out by the HCl. And the addition of a chloride is also needed. They had been experimenting with this treatment and apparently getting results in some cases. In regard to the case of sneezing mentioned by Dr. Loomis, Dr. Pratt suggested giving such a patient a teaspoonful of common salt, which has a good effect on that condition.

DR. WM. H. CONNER said he would like to call attention to a method he had found helpful in cleansing the ear of pus and epithelial debris, especially those parts of the ear inaccessible to instrumentation. The patient's head is laid on the table with the affected ear upward. The external canal is filled with equal parts of alcohol and boric solution. Then an applicator which almost but not quite fills the lumen is inserted. A piston movement up and down is made. The down stroke should be very gentle so as not to force debris farther in, but the up stroke is sufficiently rapid to create a partial vacuum. This draws out the air and permits the solution to penetrate. Successive movements will

dislodge debris and bathe with alcohol-boric-solution those parts otherwise inaccessible.

DR. W. W. LEWIS felt that, for some of those men who had taken a very decided stand on the conservative treatment of some of these conditions, the stand the Rochester men have taken, as expressed by Dr. Lillie, has been a delight and a comfort.

DR. H. O. COOPERMAN asked what percentage of silver nitrate is used in adults.

DR. DITTMAN added that, in patients who have otitis media with mucous discharge, he would suggest using a 2 or 3 per cent solution of silver nitrate to coagulate the mucus which will then come out very nicely when syringed or when a cotton-wound applicator is used to wipe out coagulum.

DR. E. R. BRAY asked whether the sense of smell is affected by the silver nitrate.

DR. H. I. LILLIE, in closing, said the dosage of iodine varies from 5 grains four or five times a day up to 7 grains four or five times a day, depending on the patient. Compound solution of iodine may be given to some people who do not mind the taste. He was not familiar with siomine, except that it is hexamethylenetitramine tetraiodide, and that its effect is that of iodine. He was glad that Dr. Spratt brought up the subject of the downflow of secretions from above. In the type of pharyngitis to which he referred, all local causative factors should be eliminated, insofar as possible.

For the treatment of vasomotor rhinitis, the entire nasal cavity is not treated. In applying the silver nitrate, the region of the ganglion is cocainized and then a small pledget of the solution of silver nitrate, well wrung out, is applied just to the region of the nasal ganglion. In regard to vasomotor rhinitis, he meant that a complete general physical examination, including all necessary laboratory studies, should be made. The etiology of vasomotor rhinitis is not known in certain cases, but there may be some endocrine disturbances in some cases and, in others, the condition may be regarded as a manifestation of allergy even though this cannot be determined.

Dr. Lillie felt that specialists in diseases of the nose and throat should consider themselves general practitioners who have of their own choice limited themselves to one part of the body; but they should keep the broader aspects of medicine before them; otherwise, they do not serve their function as rhinologists.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

SECTION OF OTOLARYNGOLOGY

Meeting of Nov. 18, 1932.

Dr. H. J. Rothschild, President, presiding.

DR. VIRGIL J. SCHWARTZ reported a case entitled "The Complications of an Upper Respiratory Disease."

The case presented herewith illustrates in a striking manner the number and variety of sequelae which may follow an ordinary rhinitis and pharyngitis.

Mrs. A. M., a woman aged 55, developed a mild acute rhinitis and pharyngitis in the early part of October, 1932. On October 13th I was asked to see her at her home and learned that her cold had existed for several days, and that two or three days prior to this a left earache had developed. The left drum had ruptured spontaneously, and a general practitioner gave her some medicine to instill. She was having considerable pain and a very profuse purulent drainage from the left ear. The nasal mucosa was hyperemic. The pharynx was moderately congested and the right drum was negative. The left external canal was excoriated and full of pus. The ear was very

tender, both anteriorly and posteriorly, and somewhat tender also over the mastoid tip. She was placed on the usual conservative dry treatment for the ear, with appropriate treatment for the nose.

The next day, October 14th, she complained of nausea, vomiting and vertigo. Her temperature was 99.6°. The next day there was less vertigo, no nausea, no vomiting and no headache. Her temperature was normal, but there was very definite nystagmus to the right; that is, undoubted labyrinthine irritation. The following day the vertigo and mastoid tenderness had diminished, and twenty-four hours later all her symptoms except the ear discharge were gone. The nystagmus had completely disappeared. On the next day her temperature was normal and the patient was anxious to be up, but it was thought best to wait a day or two. The next day, October 19th, Dr. Schwartz said he was surprised to find a well-developed left facial paresis. The patient was able to close the left eye with difficulty.

Two days later roentgenograms of the mastoids were made, and these showed a mild blurring of the cell outlines on the left side, but no cell destruction. The blood studies were practically normal: 10,000 leukocytes, of which 85 per cent were p.m.n.'s without any definite shift to the left, that is, the presence of immature forms. The differential count was normal, and the red cell count was 5,300,000. The right drum during all this time was normal. A myringotomy was done the next day on the left side. The patient was still feeling well except for the facial paresis, and her temperature was practically normal.

Early in the morning of October 24th the patient was found to be unconscious, tossing and restless. She had vomited during the night. Her temperature was 103.8° by axilla. When seen by several of us in consultation, she had definite symptoms of meningitis. A spinal puncture was done and showed 3400 p.m.n. cells per field; Gram-negative intracellular diplococci in the smears were diagnosed meningococci. Nonne was 4 plus . A culture was also made and the report twenty-fours hours later was again that of pure meningococcus.

The patient was transferred to the Contagious Hospital, where spinal fluid was withdrawn and antimeningococcic serum was injected. That night the left mastoid was opened under local anesthesia and a considerable amount of granulation tissue with pyogenic membrane was found. Two large pus pockets, one far posteriorly behind the sinus and another in the tip, were found. It is doubtful that these had any direct connection with the meningitis. The mastoid antrum was found to be very high and very narrow, and separated from the dura by an extremely thin tegmen. Cisterna puncture was done and more serum injected. A culture of this fluid showed in twenty-four hours pure hemolytic streptococcus instead of meningococcus.

The next day the patient's condition was somewhat worse, but twenty-four hours later she was considerably improved. The color and the breathing were much better. That night, however, the patient quite suddenly stopped breathing and could not be revived.

The course of events therefore was as follows: Acute rhinitis and pharyngitis leading to acute suppurative left otitis, then to acute mastoiditis followed by acute labyrinthitis, facial paresis, and finally acute meningitis. The lesion can be localized fairly definitely, in view of this course, in that small area of the medial tympanic wall which includes the most lateral portion of the horizontal semicircular canal and the knee of the facial nerve.

The question may well be raised as to the advisability of operative interference earlier in the course of this case. In retrospect this might seem to have been advisable, but, at the time, the patient was so completely free of symptoms, except for the facial paresis, that so radical a procedure as a Hinsberg or other labyrinthine operation was absolutely contraindicated.

One other point is interesting. The finding of meningococci was very surprising because the course of the disease was not at all typical for this organism. On the other hand the subsequent findings of streptococcus hemolyticus was entirely in accord with what one should have expected. The difference in treatment might possibly have affected the course of the disease, but the ultimate outcome would doubtless have been the same.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

SECTION OF OTOLARYNGOLOGY

Meting of Dec. 9, 1932.

Dr. H. J. Rothschild, President, presiding.

DR. J. A. WATSON read a paper entitled "Allergy in the Field of Ophthalmology and Otolaryngology."

DISCUSSION.

DR. JOHN S. MACNIE said he happened to be in a position to know that Dr. Watson had put a great deal of time and thought on this subject and felt that the Academy owed him a debt of gratitude for presenting this paper. When one stops to consider that between 60 and 70 per cent of all people are allergic, he can see what an important question this is and how much the various manifestations of allergy add to the sum total of human discomfort and misery. But more than this, Dr. Macnie said there are unquestionably many cases of severe reactions or even sudden death which may be attributable to allergy, which are otherwise inexplicable. He recalled a case which occurred when he was a medical student in New York and which caused quite a furor. Two interns from a large New York Hospital went up the Hudson River for an outing on a very hot day in August. These boys wore swimming trunks and had amused themselves by swimming, fishing, and lying around on a sandy strand of shore they found. They got a very severe sunburn. One of the boys lay down and went to sleep and after a while the other one picked up a piece of shingle about 2 inches wide which had floated up onto the shore. He gave the sleeping boy a light slap on the naked abdomen with this piece of wood. The boy gasped, sat up, took one or two deep breaths, grew black in the face and, to his companion's horror and consternation, died. The details of that occurrence were impressed upon Dr. Macnie's memory particularly because it happened that on that very same day two of his classmates and himself had taken an outing down on Staten Island on South Beach. There must have been some peculiar atmospheric condition that day which caused a regular epidemic of sunburn. And for years after that, whenever he was exposed to sun, Dr. Macnie said he would have an outbreak of papular and vesicular dermatitis. This is undoubtedly a light sensitization.

To return to the first case mentioned, that boy was very severely sunburned and Dr. Macnie thought it was not too much of a stretch of the imagination at least to entertain the possibility that that sunburn liberated enough antibodies so that when that blow was struck they liberated enough antigen to unite and cause spasm of the bronchioles and cause his sudden death. Dr. Macnie felt that was a possibility of a combination of light and traumatic sensitization.

Dr. Macnie said when he was on Staten Island in Service, over in New York one day in the eye infirmary he met a brother officer who related an experience which he had just witnessed. A doctor from Texas was up taking work with a well-known rhinologist. This doctor wished to have his tonsils removed before he went home. It was an ordinary local tonsillectomy. A short time later an orderly came rushing in to tell the doctor that his patient was doing badly. He was found unconscious, gasping for breath, with a full bounding pulse, cyanotic, and bleeding. The doctor thought immediately of hemorrhage and bent all his energies to checking this. At postmortem it was found that he had died of acute edema of the glottis. It is known that this edema of the glottis is a not infrequent allergic manifestation, and this victim was probably sensitized to procaine.

Dr. Macnie recalled a case reported in a recent magazine by a doctor in Detroit. The case was that of a girl 12 years old who was an allergic with asthma, but who had been free of the trouble for eighteen months by specific vaccine treatments and care with her diet. She developed epistaxis and it was decided to cauterize the bleeding point. The rhinologist applied some crystals of cocaine to this area and she immediately went into an attack of asthma. The same phenomenon happened a second time and it was concluded she was sensitized to cocaine, but, it was found later, not to procaine.

The things that people are sensitive to are almost universal: drugs, foods, dust, pollens, feathers, etc., also to physical agents such as heat, cold and light. There was a doctor in Minneapolis a few years ago who was making a call quite a way from home on a bleak March day. That was before the days when automobiles were much used, and he had taken a street car. He was waiting for a street car afterward and a friend came by in an auto and said he would like to take him home. There was no windshield on the auto and the doctor was exposed to the cold, sleety wind striking his face, and had a very severe reaction from it. Always after that, if his face was exposed to a cold wind he would break out with an urticaria. This recurred every winter. He finally had to leave this climate.

Dr. Macnie said he wished to call attention particularly to those cases that may have a dangerous termination. He recalled a patient of his who had seasonal hay fever. Some three or four years ago she was at a luncheon party. She suddenly felt a choking sensation, and her face, lips and eyelids swelled up. Fortunately they found a neighbor who was a physician who was at home and he gave her some adrenalin and terminated the attack. She had an acute edema of the larynx and even now if she eats the smallest bit of raw celery she will have an attack. She can eat cooked celery, however. Another patient had seasonal hay fever with asthma, but he had not had any attacks outside of the hay fever season. He came in to see Dr. Macnie early in January, saying that he had had for the first time a severe asthmatic attack outside the hay fever season. He was very fond of salted peanuts and the office where he worked had given him a large package of salted peanuts for Christmas, of which he had partaken freely. That night he had the worst attack of asthma he had ever had, and since then he has been unable to eat salted peanuts at all.

It is these dangerous cases that one must think of, and it behooves one to be on one's guard as the results may be so dramatic and unexpected.

Dr. Macnie said that last spring he read the article of two Los Angeles men on the use of urinary proteose in ophthalmological diseases. It seemed to offer a wonderful opportunity. It is very difficult to determine the specific antigen to which patients are sensitized. The reports of case cures by these men are so circumstantial that one cannot help feeling that they are on the right track. Dr. Macnie said he and Dr. Watson had been giving this procedure a thorough trial, but, as Dr. Watson had said, they have not had the results they had hoped for. One of his patients who came in August was sensitive to a great many grasses and trees. They obtained her interest in this work and secured specimens and separated the proteose, but they could get no cutaneous reaction whatever.

The interesting part of this latter case was that the patient and her husband were on their way to Brussels to spend a year and were stopping some time in London. While there she saw Dr. Oriel. Dr. Macnie said he had received a letter from her the other day. She said they were very nice to her and went through all the various tests in her case. She had taken over with her some proteose which Dr. Macnie and Dr. Watson had tried here with no results. In London they tried proteose from several hay fever patients, from one of which they got a reaction in her case. They then suggested that perhaps there was something wrong with the technic used by Drs. Macnie and Watson. Dr. Macnie said they had followed very carefully the directions as published and he could not see where they could have fallen down.

Dr. Macnie felt that this is a very fascinating subject and if some therapeutic short-cut can be worked out to help these unfortunate individuals, it

is going to be well worth the effort and time spent. He wished to thank Dr. Watson for bringing this subject before the Academy.

Dr. C. E. Connor said that one of the synonyms for allergy is the word "atopy," meaning a strange disease; and certainly no one could listen to the protean manifestations which Dr. Watson has related without realizing how true that is. It is interesting to turn to some of the textbooks in rhinology and read the very extensive and imposing list of synonyms which one finds there; he had found in three or four books eighteen different names for what must have been vasomotor rhinitis. This has always been an obscure condition. A few things stand out prominently in the clinical observations: (1) Vasomotor symptoms were always present and sometimes quite pronounced. (2) The symptoms were usually intermittent. (3) In many of the cases they considered a nervous element. Even today some writers adhere to a nervous element in these allergics. The confusion is illustrated in the terminology. There are various names for the antibodies, for the activating substances and for the states they produce. Whatever theory one adheres to, whether the cellular theory, the toxic theory, or that of a reflex in the parasympathetic system, the fact remains that it is still an unknown reaction. One can see the manifestations as they take place in the body, but what happens is not known. As Dr. Watson says, there is no tissue in the body which may not share in the reaction.

Dr. Connor said the thing which bothers him a good deal is the problem of the role surgery should or should not play in the treatment of asthma. The recognition of the fact that the patient is allergic is not difficult, but the finding out just what the antigen is is often quite a task. Many of the cases require no surgery at all. Frequently physicians will refer patients who have been through all the skin tests, who have tried various diets and foreign proteins without benefit, and ask the rhinologist to do something for the patient. One can assume that the bronchial asthma is entirely due to the nasal pathology, but this leads to much questionable surgery. Or one can assume that the nasal pathology and the bronchial asthma are two different manifestations of the same disease, in which case no surgery is done and the problem becomes one for the internist and the allergist.

In examination nothing should be spared in an effort to answer these questions. Only too frequently one goes through all these things and then is not able to tell the internist the cause of the asthma. Examination of the nose, the blood, the tissues for eosinophiles, x-ray with some iodin-containing oil, cultures of the nose and throat to determine the presence of infection should all be made; sometimes these will throw light on the subject and sometimes they will not help a bit. Dr. Connor was inclined to agree with Dr. Hansel, who feels that all cases of hyperplastic sinusitis should be considered allergic until proven otherwise. Allergy presents some of the most difficult problems rhinologists have.

Dr. W. I. Lillie felt that Dr. Watson's paper is a very timely one. When he was at Kalamazoo, Michigan, in September, he had heard Dr. Warren Vaughan (son of the well-known Dr. Vaughan), of Richmond, Virginia, give a paper on allergy, in which he stressed chiefly asthmatic and cardiac type of allergy and the relation which it bears to ear, nose and throat conditions. He stressed definitely that there is a bacterial allergy, and Dr. Little felt that might account for some of these allergic conditions improving by operating on the nose, throat or sinuses. As is well known, there are about 5 to 8 per cent of retrobulbar neuritis cases, regardless of the thoroughness of the examination, in which no definite etiology can be found. This makes one wonder if retrobulbar neuritis may not be due to allergy, in some cases. He wondered if the eye men should not pay more attention to allergy than they have before.

Dr. J. A. Pratt stated, in reference to Dr. McGeary's question, that he made it a point to ask—in the case of women patients—if the allergy dated from the time of marriage or was present prior to marriage.

In reference to nasal operations in allergic cases, all hyperplastic tissue should be removed and in cases of antral infections, a small window resection

should be performed in the antral wall and the normal opening be enlarged to give proper ventilation and drainage. They had had many cases which were apparently cured by operating the sinuses. A patient of Dr. Pratt, a physician from South Dakota, who was using injections of adrenalin every two hours, was freed from asthma following the operations for pansinusitis.

DR. F. N. KNAPP said that in asthmatic cases, combined with chronic purulent sinusitis, a radical sinus operation is indicated. Following operation, three to ten days, 20 mg. of radium are inserted in the middle meatus for six to eight hours. Then the internist continues treatment with small doses of tuberculin for three to six months to build up an immunity. Their results are very gratifying, both to the patient and rhinologist.

DR. LAURA LANE stated there is an allergy which is purely local. It is caused by allergens remaining on the surface of the mucous membrane rather than being absorbed and passing into the blood. Allergens of this type are usually of an oily nature and do not penetrate into the tissues. One would not get a proteose reaction in the urine in such cases.

In the past year there have been reports of a single identical allergic substance in different pollens. Patients often react to several members of closely related substances or species. This substance is found frequently in the various grasses.

There is another kind of allergen which is quite common, namely, that derived from the foreign protein in bacterial infections. Asthma may be of this type. During the last few years fungi and moulds have become important allergic factors, particularly in asthma. Some cases may be due to a yeast rather than a bacterial infection or polyposis of the nose.